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**BIBLIOGRAPHY OF UTAH BOTANY
AND WILDLAND CONSERVATION**

by
EARL M. CHRISTENSEN



BIOLOGICAL SERIES — VOLUME IX, NUMBER 1

JUNE, 1967

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BIBLIOGRAPHY OF UTAH BOTANY AND WILDLAND CONSERVATION

by

Earl M. Christensen¹

INTRODUCTION

This bibliography includes articles on botany *per se*, biotic communities, range management, watershed management, forestry, recreational use of wildlands, and those aspects of zoology and wildlife management involving plant communities or habitat management. Most of the references are to scientific papers and theses,

but selected semipopular and popular articles are included. References published by December 31, 1964 are listed. The references are arranged alphabetically by author. A chronological arrangement follows the alphabetical listing. A general subject index based on the reference titles is included also.

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CHRONOLOGICAL ARRANGEMENT

- | | | | |
|------|--------------------------------|------|------------------------------------|
| 1845 | Torrey, John and J. C. Frémont | 1883 | Braun, A. |
| 1852 | Torrey, John | | Hall, E. C. |
| 1855 | Torrey, John and Asa Gray | | Jones, Marcus E. |
| 1860 | Durand, E. | 1884 | Sargent, Charles Sprague |
| 1871 | Parry, C. C. | 1885 | Coulter, John M. |
| | Watson, Sereno a,b | | U. S. Bureau of the Census |
| 1873 | Coulter, John M. | | Watson, Sereno |
| | Hayden, F. V. | 1886 | Bailey, L. H. |
| | Lesquereux, Leo | 1887 | Engelmann, George |
| | Watson, Sereno | 1888 | Jones, M. E. a,b,c,d,e |
| 1874 | Newberry, John S. | | Knowlton, Frank H. |
| | Watson, Sereno | | Swaner, J. C. a,b,c |
| 1875 | Parry, C. C. | | Tracy, S. M. |
| | Watson, Sereno | 1890 | Talmage, J. E. |
| 1876 | Engelmann, George a,b | 1891 | Jones, Marcus E. a,b |
| | Gray, Asa | | Sargent, Charles Sprague |
| | Parry, Charles C. | 1892 | Coville, F. V. |
| 1877 | Watson, Sereno | | Eastwood, Alice |
| 1878 | Anonymous | | Jones, Marcus E. |
| | Gray, Asa | | Merriam, C. Hart |
| | Hough, Franklin B. | 1893 | Coville, Frederick Vernon |
| | Lemmon, J. G. | | Eastwood, Alice a,b |
| | Palmer, Edward | | Jones, Marcus E. a,b |
| | Rothrock, J. T. | | Merriam, C. Hart a,b,c |
| | Rothrock, J. T. and Others | 1894 | Jones, Marcus E. |
| | Wheeler, First Lieut. Geo. M. | 1895 | Eastwood, Alice |
| 1879 | Coulter, John M. | | Jones, M. E. |
| | Jones, M. E. | 1896 | Coville, F. V. |
| | Powell, J. W. | | Eastwood, Alice |
| | Sargent, C. S. | | Fortier, Samuel |
| | Watson, Sereno | | Jones, Marcus E. |
| 1880 | Gray, Asa | 1897 | Packard, A. S., Jr. |
| | Gray, Asa and Joseph D. Hooker | | Rydberg, P. A. and C. L. Shear |
| | Johnson, J. E. | | Sears, F. C. |
| | Jones, Marcus E. a,b | 1898 | Merriam, C. Hart |
| 1881 | Jones, Marcus E. | | Smith, Jared G. |
| | Greene, Edward Lee | 1899 | Hedrick, U. P. |
| 1882 | Dutton, C. E. | | Rydberg, P. A. |
| | Gray, Asa | 1900 | Gardner, Frank D. and John Stewart |
| | Hough, Franklin B. | | Jones, Marcus E. |
| | Jones, M. E. a,b,c | | Knowlton, Frank N. |
| | Watson, Sereno | | Rydberg, P.A. a,b,c,d |

- 1901 Rydberg, P. A.
 1902 Eastwood, Alice
 Kearney, Thomas H. and Frank K. Cameron
 Rydberg, P. A.
 1903 Pammel, L. H.
 Potter, Albert F.
 1904 Britton, N. L.
 Sanchez, Alfred M.
 1905 Greene, Edward L.
 McLaughlin, W. W.
 Pammel, L. H.
 Rydberg, P. A.
 1906 Anonymous
 Jensen, A. W.
 Richardson, G. B.
 Thornber, J. J.
 1907 Anonymous
 Fink, Bruce
 Rydberg, Per Axel a,b
 1908 Anonymous
 Jones, Marcus E.
 MacDougal, Daniel Trembly
 Paul, J. H. a,b
 1909 Butler, Bertram T.
 Coulter, John M. and Aven Nelson
 Cutler, John C.
 Frothingham, E. H.
 Richardson, G. B.
 Utah Conservation Commission
 1910 Daines, Lyman Luther
 Garrett, A. O.
 Hall, H. M.
 Hodson, E. R. and J. H. Foster
 Jones, Marcus E.
 Pammel, L. H.
 Rollins, G. W.
 Smith, C. P.
 1911 Anonymous
 Bowman, Isaiah
 Chamberlain, Ralph Vary
 Hodson, E. R.
 Jones, Marcus E.
 Meinzer, Oscar E.
 Reynolds, R. V. R.
 Rydberg, P. A.
 Stewart, Robert
 Weigle, W. G. and E. H. Frothingham
 Young, Levi Edgar
 1912 Boutwell, John Mason
 Harris, F. S.
 Nelson, Aven
 Widtsoe, John A.
 1913 Cardon, P. V.
 Garrett, A. O. a,b
 Greeley, William B.
 Johnson, Ben
 Mason, Silas C.
 Pammel, L. H.
 Paul, J. H. and Claude T. Barnes
 Paul, J. H., Claude T. Barnes, and Elizabeth Cannon Porter
 Peterson, E. G. and E. Mohr
 Porter, M. Rich
 Rydberg, P. A.
 Stewart, Robert
 Tidestrom, Ivar
 Utah Conservation Commission
 1914 Anonymous a,b
 Garrett, A. O.
 Hedgcock, G. G.
 Kearney, T. H., L. J. Briggs, H. L. Shantz, J. W. McLane, and R. L. Piemeisel
 McCain, A. C.
 Merrill, Lewis A.
 O'Gara, P. J. a,b,c
 Pammel, L. H.
 Paul, Joshua Hughes
 Paul, J. H. and Claude T. Barnes a,b
 Rydberg, Per Axel
 Utah State Bureau of Immigration, Labor and Statistics
 1915 Armstrong, Margaret and J. J. Thornber
 Berry, Edward W.
 Garrett, A. O.
 Harris, F. S.
 Mason, D. T.
 McAtee, W. L.
 O'Gara, P. J. a,b
 Rydberg, P. A.
 Sudworth, George B.
 1916 Barnes, Will C. and James T. Jardine
 Clements, F. E.
 Davis, Charles A.
 Gregory, Herbert E.
 Harris, F. S.
 O'Gara, P. J. a,b
 Paul, J. H.
 Rydberg, P. A. a,b
 Shantz, H. L.
 Sudworth, George B.
 1917 Anonymous
 Butters, Frederic K.
 Daines, L. L.
 Fetherolf, James M.
 Grosvenor, Gilbert H.
 Korstian, C. F.
 Maxon, William R.
 McAtee, W. L.
 O'Gara, P. J.
 Rydberg, P. A. a,b
 Saunders, Charles F.
 Shreve, Forrest

- Standley, Paul Carpenter
Sudworth, George B.
Tillotson, C. R. a,b
Winchester, Dean E.
Young, Levi Edgar
- 1918 Baker, F. S.
Hartley, Carl
Maxon, William R.
Sampson, Arthur W.
Sampson, Arthur W. and Leon H. Weyl
Sudworth, George B.
- 1919 Anonymous
Fenn, H. E.
Garrett, A. O.
Hartley, Carl, Roy G. Pierce, and Glen G. Hahn
Jardine, James T. and Mark Anderson
Jones, Marcus E.
Kimerer, Keith
Marsh, C. D., A. B. Clawson, and H. Marsh
Maxon, William R.
Pack, Dean A.
Rydberg, P. A.
Sampson, Arthur W. a,b
Smith, Charles Piper
- 1920 Anonymous
Baker, F. S. a,b,c
Clements, Frederic E.
Harris, Franklin Stewart
Hartley, Carl and Glenn G. Hahn
Marsh, C. Dwight and A. B. Clawson
Paul, J. H.
Pennell, Francis W.
Saccardo, P. A.
- 1921 Alter, J. Cecil
Anderson, Mark
Baker, F. S.
Baker, Frederick S., C. F. Korstian, and N. J. Fetherolf
Butters, Frederic
Garrett, A. O. a,b,c
Korstian, Clarence F. a,b,c,d
Korstian, C. F. and N. J. Fetherolf
Livingston, Burton E. and Forrest Shreve
Locke, S. B.
U. S. Forest Service
Wetmore, Alexander
Zundel, George L.
- 1922 Anonymous
Blake, Sidney Fay
Carroll, W. E.
Dougherty, S. S.
Garrett, A. O.
James, George Wharton
Peterson, William
Rydberg, P. A.
- 1923 Garrett, A. O.
Hall, Harvey M. and Frederic E. Clements
Jones, Marcus E.
Knowlton, Frank
Korstian, Clarence F.
Stewart, George
Tidestrom, Ivar
- 1924 Aldous, A. E. and H. L. Shantz
Cannon, George M.
Cottam, Walter P.
Forsling, C. L.
Frederick, Elfriede
Garrett, A. O.
Hammond, H. L.
Harris, J. Arthur, R. A. Gortner, W. F.
Hoffman, J. V. Lawrence, and A. T. Valentine
Korstian, Clarence F.
Lyman, Richard L.
Marsh, C. D.
Shantz, H. L. and R. Zon
Stewart, G. a,b
Trelease, William
- 1925 Baker, F. S. a,b
Craighead, F. C.
Croft, A. R.
Evans, Pansy Alice
Garrett, A. O.
Groesbeck, J. Rowe
Korstian, C. F.
Korstian, C. F. and F. S. Baker
Linford, M. B.
Norrington, A.
Paul, J. H. and F. S. Baker
Sampson, Arthur W. a,b
Shantz, H. L.
Stewart, George
Tidestrom, Ivan
White, Charles Langdon
- 1926 Allee, W. C.
Baker, F. S. and S. B. Locke
Barnes, W. C.
Bartram, Edwin B.
Campbell, Douglas Houghton
Cottam, Walter P.
Evans, P. Alice
Flowers, Seville
Garrett, A. O. a,b,c
Harris, Marion L.
Harrison, J. William
Payson, Edwin Blake
Sampson, Arthur W. and Harry E. Malmsten
Sargent, Charles Sprague
Shelford, V. E.
Tanner, Vasco M.

- U. S. Congress, Senate Committee on
Public Lands and Surveys
U. S. Forest Service
- 1927 Bartram, Edwin B.
Berry, Edward W.
Cottam, Walter P.
Eastwood, Alice
Gilman, J. C. and E. V. Abbott
Harris, J. Arthur
Hildebrand, Samuel F. and Irving L.
Towers
Meinzer, Oscar Edward
Mitchell, Guy Elliott
Norrington, A.
Peterson, W., P. V. Cardon, K. C. Ikeler,
G. Stewart, and A. C. Esplin
Reagan, Albert B.
Rydberg, Per Axel
Sudworth, George B.
Thériot, I.
Van Cott, Oscar
- 1928 Arnold, Frank R.
Clements, Frederic E.
Forsling, C. L.
Kartchner, James A.
Locke, S. B.
Munz, Philip A.
Parkinson, Dana
Peterson, William and D. C. Tingey
Stewart, George
Stewart, James O.
Wanlass, W. L.
Watson, Elba E.
Weight, Kenneth E.
- 1929 Arnold, Frank R.
Bradley, Wilmot H. a,b
Brown, Roland W.
Cottam, Walter P. a,b,c,d
Erlanson, Eileen Whitehead
Fitzgerald, O. A. a,b
Flowers, Seville
Forsling, C. L. and Earle V. Storm
Garrett, A. O.
Johnson, Ben
Locke, S. B. a,b,c
Meinecke, E. P.
Parkinson, Dana
Rydberg, Per Axel
Stewart, James O.
U. S. Congress, House Committee on
Public Lands
Woodbury, A. M. a,b,c
- 1930 Berry, Edward W.
Cottam, Walter P.
Croft, A. R.
Eardley, A. J.
Forsling, C. L.
Ganaux, Charles M.
Jolley, Donal J.
Jones, Marcus E. a,b
Knowlton, George F.
Locke, S. B.
Mathias, Mildred E.
Munz, Philip A.
Nelson, Enoch W. a,b
Parkinson, Dana a,b
Porter, Marlow Rich
Standley, Paul C.
Stewart, George
Tanner, Vasco M.
Taylor, T. G.
U. S. Forest Service a,b
Winkler, Ernest
Woodbury, A. M. a,b
- 1931 Baker, F. S. and C. F. Korstian
Becraft, R. J.
Blake, S. F.
Bradley, Wilmot H.
Burr, George O.
Cannon, S. Q.
Cottam, W. P.
Forsling, C. L.
Goodman, G. J.
Jolley, Donal J.
Munz, Philip A.
Nelson, Aven
Parkinson, Dana a,b,c
Peterson, W.
Reid, H. L.
Rutledge, R. H.
Snow, Edna
Standing, Arnold
Stanton, William D.
Stewart, George, and C. L. Forsling
Svihla, Ruth Dowell
Swallen, Jason R.
Tanner, Vasco M. a,b
Thornton, J. W.
U. S. Forest Service
[Utah] Special Flood Commission
Woodbury, Angus M.
- 1932 Anonymous
Andrews, A. LeRoy
Bailey, Reed W.
Colton, Hon. Don B.
Eardley, A. J.
Fernald, M. L.
Goodman, G. J. and C. L. Hitchcock
Gray, John
Harrison, Bertrand F.
Jolley, D. J.
Knight, Betty Marie
Martin, Thomas L. and Owen M. Davis
Mathias, Mildred E.

- Mushbach, Geo. E.
 Patraw, Mrs. P. P.
 Pickford, G. D.
 Russell, Harold
 Rydberg, Per Axel
 Snow, Edna
 Svihla, Ruth Dowell
 Swallow, O. Truman
 Thomas, Kathryn
 U. S. Congress, House Committee on
 Public Lands
 Weight, K. E.
 White, Walter N.
 William, Louis
 Woodbury, A. M. a,b
 1933 Anderson, R. C.
 Biddulph, Orlin
 Cottam, Walter P.
 Cottam, Walter P. and Kathryn E. Thomas
 Dunn, Paul M.
 Eastwood, Alice
 Flowers, Seville a,b,c
 Garrett, A. O.
 Gregory, Herbert E.
 Hansen, Wilford L.
 Hitchcock, A. S.
 Jones, M. E.
 Knight, Betty Marie and W. P. Cottam
 Olsen, Orange A.
 Parker, Thomas C.
 Parkinson, Ernest W.
 Patraw, Pauline Mead
 Paul, J. H.
 Pennell, Francis W.
 Peterson, William
 Presnall, C. C. a,b
 Smith, Justin M.
 Standing, Aronld R.
 Stanton, William D.
 Starr, C. P.
 Taylor, T. G. and Lee Kay
 Taylor, T. G. and B. C. Pittman
 Wakefield, Homer
 Weight, K. E. a,b
 Winsor, L. M. a,b
 Woodbury, A. M.
 Woodbury, A. M. and Mark Anderson
 1934 Bailey, Reed W., C. L. Forsling and
 R. J. Becraft
 Bailey, Reed W.
 Ball, Carleton R.
 Barrett, Charles Elmer
 Becraft, R. J.
 Brown, Almeda Perry
 Brown, Roland W.
 Burke, Melvin H.
 Cannon, George M.
 Clements, Frederic E.
 Darlington, Josephine
 Eastwood, Alice
 Flous, F.
 Flowers, Seville
 Hanna, Leo A.
 Harris, J. Arthur, *et al*
 Hazzard, A. S.
 Hermann, Frederick J. a,b
 Johnson, J. Harlan
 Keck, David D. a,b
 Kirkpatrick, Ruth
 Nelson, Aven
 O'Keson, Clifford J.
 Pennell, Francis W.
 Plair, T. B.
 Presnall, C. C. a,b
 Read, Charles E. and Roland W. Brown
 Stewart, George
 Steyermark, Julian A.
 Sudworth, George B.
 Tanner, Vasco M. and C. Lynn Hayward
 Weight, K. E.
 Williams, Louis a,b
 1935 Bailey, Reed W. a,b
 Benson, Seth Bertram
 Blake, S. F.
 Broadus, Mabel Jones
 Byers, Horace G.
 Croft, A. R.
 Dixon, Helen a,b
 Dunn, Paul M.
 Flowers, Seville
 Gill, L. S.
 Graham, Edward H.
 Hazzard, A. S. a,b
 Kearney, Thomas H.
 Maguire, Bassett
 McCarty, Edward C.
 Menzies, Charles W.
 Pearson, G. A.
 Pennell, Francis W.
 Pickford, G. D. and George Stewart
 Presnall, C. C.
 Pyper, George D.
 Sharp, Ward McClintic
 Stewart, George
 Weight, K. E. a,b,c
 1936 Anonymous
 Bailey, Reed W. and Charles A.
 Connaughton
 Brown, Roland W.
 Campbell, R. S.
 Chapline, W. R.
 Chegwidden, Maud
 Chick, W. Drew
 Clements, Frederic E.

- Cook, Newell B. a,b
 Croft, A. R.
 Dunn, Paul M.
 Eastwood, A.
 Evans, Frederick R.
 Flowers, Seville
 Forsling, C. L., Fred P. Cronemiller, Percy
 E. Melis, Arnold R. Standing, Alva A.
 Simpson, and Rex King
 Garrett, A. O.
 Henry, L. K.
 Hitchcock, C. Leo
 Larsen, C. Eugene
 McArdle, Richard E. and David F.
 Costello
 McArdle, Richard E., David F. Costello,
 E. E. Birkmaier, Carl Ewing, B. A.
 Hendricks, C. A. Kutzleb, Alba A.
 Simpson, and Arnold R. Standing
 McKay, J. W.
 Moffett, J. W.
 Nelson, Aven
 Palmer, L. J. and S. B. Snow
 Patrick, Ruth
 Rasmussen, D. I.
 Smith, Winslow Whitney
 Stewart, George and S. S. Hutchings
 Stewart, George and Wesley Keller
 Talbot, M. W.
 Tanner, Vasco M.
 Tillohash, Toney
 U. S. Forest Service
 Wakefield, Homer
 Watts, L. F., George Stewart, Charles
 Connaughton, L. J. Palmer, and M. W.
 Talbot
 Williams, Louis O. a,b
 Woodbury, A. M.
 1937 Bailey, Reed W.
 Bartholomew, Virga and Thomas L.
 Martin
 Cottam, Walter P.
 Croft, A. R., Lowell Woodward, and
 D. A. Anderson
 Eastwood, Alice a,b
 Esplin, A. C., J. E. Greaves, and L. A.
 Stoddart
 Farnsworth, Raymond B. and Thomas L.
 Martin
 Flowers, Seville
 Garrett, A. O.
 Graham, Edward H. a,b,c
 Hardy, Ross
 Johnston, Ivan M.
 Jones, Marcus E. a,b
 Keck, David D.
 Maguire, Bassett
 Marshall, William H.
 Marshall, William H. and Max S. Jensen
 McGuire, John H.
 Nelson, Lowry
 Olsen, C. J.
 Peterson, Howard B. and Thomas L.
 Martin
 Peterson, Ira L.
 Piranian, George
 Presnall, C. C.
 Price, Raymond, and R. B. Evans
 Snow, Rex T.
 Thiessen, Reinhardt and George C.
 Sprunk
 Wakefield, Homer
 Williams, Cecil S. and William H.
 Marshall
 Williams, Louis O.
 Woodbury, Angus M.
 1938 Anonymous a,b
 Adams, Thomas C.
 Babcock, E. B. and G. L. Stebbins
 Baker, Milo S.
 Beetle, Alan A.
 Bercaw, Louise O., Annie M. Hannay, and
 Mary G. Lacy
 Butt, Newbern I.
 Byers, Horace G., John T. Miller, K. T.
 Williams, and H. W. Lakin
 Christensen, Dale Clair
 Clausen, Robert T.
 Clover, Elzada U.
 Craddock, George W.
 Fosberg, F. R.
 Gregory, Herbert E.
 Hasler, J. W. and A. L. Crawford
 Knowlton, George F. and Leonard L.
 Hansen
 Martin, Thomas L.
 McCarty, Edward C.
 McKelvey, Susan Delano
 Munns, E. N.
 Munz, P. A.
 Oborn, Eugene Timbrell
 Presnall, C. C.
 Price, Raymond
 Shantz, H. L.
 Sharpe, C. F. Stewart
 Stewart, George
 Stoddart, L. A., P. B. Lister, George
 Stewart, T. Dean Phinney, and L. W.
 Daron
 Stokes, William Lee
 Weaver, John E. and Frederic E. Clements
 Williams, Cecil S. and Wm. H. Marshall
 Woodbury, A. M.
 1939 Beal, J. A.

- Beath, O. A., C. S. Gilbert, and H. F. Eppson
 Calkins, Hugh G.
 Costello, David F. and Raymond Price
 Cottam, Clarence and Cecil S. Williams
 Cottam, Walter P.
 Cronquist, Arthur
 Cutler, Hugh C.
 Detling, LeRoy E.
 Dice, Lee R.
 Dixon, Joseph S. and E. Lowell Sumner, Jr.
 Ellis, Don E.
 Garrett, A. O.
 Gold, Herbert
 Griner, Lynn A.
 Hanson, Wallace R.
 Harrison, Bertrand F.
 Hill, George R.
 Hitchcock, C. Leo
 Hull, A. C.
 Hull, A. C., Jr., and Thomas L. Martin
 Johnston, Ivan M.
 Markham, Ben S.
 Martin, A. C. and F. M. Uhler
 McVaugh, Rogers
 Miner, E. L.
 Munz, Philip A.
 Nielson, Averil B.
 Nisson, Antone W.
 Plummer, Arthur Perry
 Rasmussen, D. I. a,b
 Rollins, Reed C.
 Rowalt, E. M.
 Snow, Edna and George Stewart
 Stewart, George, R. H. Walker, and Raymond Price
 Turpin, R. L.
 Wheeler, Louis Cutter
 Woodbury, A. M.
 Yeager, M. Ward
- 1940 Anderson, Dean A. and Ernest L. Miner
 Axelrod, D. I.
 Beath, O. A., C. S. Gilbert, and H. F. Eppson
 Braken, A. F.
 Brenckle, J. F. and W. P. Cottam
 Brown, Roland W.
 Carter, Kate B.
 Clark, Ira
 Cottam, Walter P., A. O. Garrett, and Bertrand F. Harrison
 Cottam, Walter P. and George Stewart
 Cronquist, Arthur
 Domingo, Wayne E.
 Dunn, Paul M.
 Ellison, Lincoln
 Hanson, Wallace R. and L. A. Stoddart
- Hayward, C. Lynn
 Hilton, James Waldo
 Holt, Wendell L.
 Howell, John Thomas
 Jensen, G. H.
 Jones, George Neville
 Knowlton, George F.
 Lambert, Carlyle B.
 Long, W. S.
 Maguire, Bassett
 Marshall, William H.
 Nisson, A. W. and B. F. Harrison
 Peck, Raymond E.
 Preston, R. J.
 Rasmussen, D. I. a,b
 Richards, B. L.
 Rollins, Reed C.
 Roth, Arthur H., Jr.
 Saunderson, Mont H.
 Shantz, H. L. and R. L. Piemeisel
 Smith, Arthur D.
 Snow, Edna
 Spencer, Joseph Earle
 Stewart, George, W. P. Cottam, and Selar Hutchings
 Stockwell, Palmer
 Stoddart, L. A. a,b
 Tanner, Vasco M. a,b
 Terry, William Z.
 Woodbury, A. M. a,b
- 1941 Anderson, D. A.
 Bailey, R. W.
 Bailey, Harold E. and Virginia Long Bailey
 Beath, O. A., C. S. Gilbert, and H. F. Eppson
 Beetle, Alan A.
 Buhler, Ernest O.
 Clover, E. U. and Lois Jotter
 Constance, Lincoln
 Dunn, Paul M.
 Eastwood, Alice
 Ellison, Lincoln
 Evans, Thomas B.
 Fautin, Reed Winget
 Hilton, James W.
 Holt, Wendell L. and J. E. Greaves
 Hull, A. C., Jr.
 Kelker, George Hills
 Keller, Wesley
 Knowlton, Bryant Sutton
 Knowlton, George F.
 Larson, E. N.
 Long, W. S.
 Maguire, Bassett a,b
 Maguire, B. and A. H. Holmgren

- Maguire, Bassett and Robert E. Woodson, Jr.
 McAtee, W. L.
 McVaugh, Rogers
 Munz, Philip A.
 Nord, A. G.
 Olsen, C. J.
 Pearse, C. Kenneth
 Pitelka, Frank A.
 Richards, B. L. and Lee M. Hutchins
 Robb, W. L.
 Snow, Rex B.
 Stewart, George a,b
 Stoddart, L. A. a,b
 Tingey, D. C. and Bassett Maguire
 Wherry, Edgar T.
 Woods, C. N. a,b
- 1942 Anonymous a,b
 Beck, D Elden
 Bracken, A. F.
 Bradley, George Wallace
 Clayton, Vaugh A.
 Cook, C. Wayne
 Cronquist, Arthur
 Dougall, Patricia
 Eastwood, Alice a,b
 Ensign, Margaret
 Evans, R. T.
 Flowers, Seville
 Henderson, W. W.
 Hochmuth, H. P., E. R. Franklin, and Marion Clawson
 Howell, John Thomas a,b,c
 Kearney, Thomas H., Robert H. Peebles, and Collaborators
 Keller, Allan C.
 Knowlton, George F.
 Maguire, Bassett a,b
 Maguire, Bassett and G. Hortin Jensen
 Marshall, William H. and Lyndon J. Leatham
 McCarty, Edward C. and Raymond Price
 McClintock, Elizabeth and Carl Epling
 Norris, J. J.
 Olsen, Orange A.
 Pady, S. M.
 Rodgers, Andrew Denney III
 Shreve, Forrest
 Smith, Justin G.
 Stewart, George
 Stoddart, L. A. and J. E. Greaves
 Twomey, Arthur C.
 Utah Writers' Project, Work Projects Administration
 Wherry, Edgar T.
- 1943 Andrews, H. N.
 Barneby, R. C.
 Barnes, Claude T.
 Beath, O. A.
 Beetle, Alan A.
 Behle, William H.
 Blanch, George T. and Clyde E. Stewart
 Bracken, A. F. and R. J. Evans
 Bundy, Ora
 Correll, Donovan S.
 Croft, A. R., Lowell Woodward, and D. A. Anderson
 Cronquist, Arthur a,b,c
 Dice, Lee R.
 Elias, Maxim K.
 Ellison, Lincoln
 Hayward, C. Lynn
 Hitchcock, C. Leo
 Holmgren, A. H.
 Howell, John Thomas a,b
 Hurd, Richard M. and C. Kenneth Pearse
 Leonard, Ross
 Maguire, Bassett
 Olsen, Orange
 Plummer, A. Perry
 Plummer, A. Perry, Richard M. Hurd and C. K. Pearse
 Schulman, Edmund
 Stewart, George
 Stewart, George and John A. Widtsoe
 Stoddart, L. A. a,b
 Stoddart, L. A. and C. W. Cook
 Wherry, Edgar T.
 Woodward, Lowell
- 1944 Baker, F. S.
 Barneby, R. C. a,b
 Beetle, Dorothy E.
 Benson, Lyman and Robert A. Darrow
 Bracken, A. F.
 Broadbent, Dee A.
 Cain, Stanley A.
 Chaney, Ralph W.
 Clark, Ira
 Coffman, W. Elmo
 Doman, Everett R. and D. I. Rasmussen
 Doran, C. W.
 Ellison, Lincoln and A. R. Croft
 Ewan, Joseph
 Flowers, Seville
 Gregory, Herbert E.
 Hardy, Ross
 Hardy, Cecil Ross
 Holmgren, Arthur H.
 Maguire, Bassett
 Olsen, Orange A.
 Ottley, Alice M.
 Plummer, A. Perry
 Plummer, A. Perry and George Stewart
 Robinette, W. Leslie and Orange Olsen

- Rodgers, Andrew Denney III a,b
 Smith, Arthur D.
 Stewart, George
 Stewart, George and S. S. Hutchings
 Stoddart, L. A. a,b
 Turpin, R. L.
 U. S. Forest Service
 Walker, R. H.
 Watanabe, Seichi
 Wherry, Edgar T.
 Worlton, James T.
- 1945 Anonymous
 Aldous, C. M.
 Barneby, R. C. a,b
 Barnes, Claude T.
 Carter, George F.
 Clark, Ira
 Clements, F. E. and Clements, E. S.
 Cottam, W. P.
 Cottam, W. P. and F. R. Evans
 Craddock, George W.
 Craddock, George W. and Lowell
 Woodward
 Croft, A. R.
 Flowers, Seville
 Galway, Desma H. a,b
 Gould, Frank W.
 Gregory, H. E. a,b
 Hardy, Ross a,b
 Hayward, C. Lynn
 Heinecke, Gertrude K.
 Holmgren, Arthur H.
 Kelker, George Hills
 Lauder milk, Jerome D.
 Murrill, W. A.
 Richards, B. L.
 Schulman, Edmund
 Snow, Edna
 Stewart, George
 Stoddart, L. A. a,b,c
 Stoddart, L. A. and D. I. Rasmussen a,b
 U. S. Forest Service
 Woodbury, A. M. and Henry Norris
 Russell, Jr.
 Woodward, Lowell and George W.
 Craddock
- 1946 Anonymous a,b
 Barneby, R. C.
 Carr, William H.
 Chamberlin, Ralph V.
 Cook, Clyde John
 Cottam, Walter P.
 Craddock, George W.
 Croft, A. R. a,b
 Daston, J. S.
 Ellison, Lincoln
 Fautin, Reed W.
 Hansen, Henry P.
 Harris, Franklin S.
 Holmgren, A. H.
 Hutchings, Selar S.
 Ives, Ronald L.
 Janson, Ruel
 Johnson, A. G. and R. W. Leukel
 Jones, G. N.
 Keck, David D.
 Knowlton, George F.
 Leonard, Ross
 Maguire, Bassett a,b
 Maguire, Bassett and Arthur H. Holmgren
 a,b
 Mahoney, J. R.
 McDonald, John E.
 Munns, E. N.
 Plummer, A. Perry
 Rhoads, A. S.
 Stoddart, L. A. a,b,c
 Tanner, Vasco M.
 Vansell, George H.
 Woolley, R. R.
- 1947 Anonymous a,b,c,d,e,f
 Bailey, Reed W., George W. Craddock,
 and A. R. Croft
 Barneby, R. C. a,b,c
 Boyle, A. C.
 Brush, W. D.
 Chamberlin, Ralph V.
 Cliff, Edward P.
 Cook, C. Wayne and L. A. Stoddart
 Cottam, W. P. a,b
 Croft, A. R.
 Ellison, Lincoln a,b
 Esplin, A. C.
 Hansen, W. L.
 Hardy, Ross a,b
 Hervey, Ralph J. a,b
 Hitchcock, C. Leo and Bassett Maguire
 Hull, A. C., Jr. and Joseph F. Pechanec
 Leonard, Ross
 Leonard, R. Boyd
 Leopold, Aldo, Lyle K. Sowls, and David
 L. Spencer
 Luke, Theron H.
 Maguire, Bassett a,b
 Mason, Fred
 McCullough, C. W.
 McKelvey, Susan Delano
 McNulty, Irving B.
 Mielke, James L. and Ross W. Davidson
 Munns, E. N.
 Nord, A. G.
 Olsen, C. J.
 Plummer, A. Perry
 Rasmussen, D. I.

- Rasmussen, D. I. and Everett R. Doman
 Richards, L. A.
 Smith, Arthur D. a,b
 Stewart, George a,b
 Stewart, George and A. Perry Plummer
 Thomas, Hon. Elbert D. a,b
 Utah Dept. of Public Instruction
 Walters, Joel
 Woodbury, Angus M.
 Woolley, Ralf R.
 Young, Orson Whitney
 1948 Anonymous a,b,c
 Bailey, R. W. a,b,c
 Beck, D Elden
 Behle, William H.
 Bleak, Alvin T.
 Campbell, R. S., Lincoln Ellison, and
 F. G. Renner
 Chapline, W. R.
 Coffman, Elmo
 Constance, Lincoln and Ren Hwa Shan
 Costley, R. J., P. F. Allan, Odell Julander,
 D. I. Rasmussen
 Cottam, Clarence
 Cottam, Walter P. a,b
 Craddock, George W.
 Croft, A. R.
 Curtis, James D. a,b
 Ellison, Lincoln a,b
 Fautin, Reed W.
 Fenley, John M.
 Frehner, Leon
 Green, Lisle R.
 Hardy, Ross
 Hayward, C. Lynn
 Holmgren, Arthur H. a,b
 Hunt, Charles B.
 Johnston, Ivan M. a,b,c
 Kay, Lee
 Keller, Wesley and H. R. Hochmuth
 Lillian, Walt
 Little, Elbert L.
 Lobenstein, Henry
 Lorentzen, Eden
 Low, Jessop B. a,b
 Major, Jack
 Marston, Richard B.
 McIlvain, E. H.
 McMillan, Calvin
 Partridge, Donald B.
 Presnall, Clifford C.
 Price, Raymond
 Price Raymond, K. W. Parker, and A. C.
 Hull, Jr.
 Schemel, Mart Phillips
 Schulman, Edmund
 Smith, Arthur D.
 Sprague, Roderick, George W. Fischer,
 and Jack P. Meiners
 Stewart, George a,b,c,d
 Stoddart, L. A.
 Thorne, D. W.
 Tracy, Aaron W.
 Turner, Lewis M.
 Tuttle, L. Elliott
 Utah Academy of Sciences, Arts and
 Letters
 Utah Fish and Game Bul.
 Wilson, Vaney T.
 Wood, R. D.
 Woodbury, Angus M. a,b
 Woods, C. N.
 Woods, John B.
 Woolfolk, E. J., D. F. Costello, and B. W.
 Allred
 Wooley, Ralf R.
 Young, Orson Whitney
 1949 Anonymous a,b,c
 Bailey Reed W.
 Baker, Milo S.
 Baker, William L.
 Ball, Carleton R.
 Barneby, R. C. a,b
 Billings, W. D.
 Brown, Roland W.
 Christensen, Earl M.
 Clements, Frederic E.
 Ellison, Lincoln a,b
 Everson, Axel C.
 Farnsworth, Raymond B. and Thomas L.
 Martin
 Ferguson, C. W.
 Flowers, Seville
 Ford, Thomas Stanley
 Frischknecht, Neil C.
 Frischknecht, Neil C. and A. Perry
 Plummer
 Gregory, Herbert E.
 Holmgren, Arthur H. and Bassett Maguire
 Hyder, Donald N.
 Keller, Wesley
 Klomp, Gerard J.
 Knight, Ralph A.
 Lindsay, Delbert W.
 Little, Elbert L., Jr.
 Lofgren, B. F.
 Lull, Howard W.
 Marston, Richard B.
 Matson, G. A., A. Rauve, J. M. Sugihara,
 and W. J. Burke
 McDougall, W. B.
 Nelson, Noland F.
 Nielson, A. Errol
 Olson, O. C.

- Plummer, A. Perry
 Popov, Boris H.
 Rasmussen, D. Irvin and David M. Gaufin
 Robinette, W. Leslie
 Schulman, Edmund
 Sharp, Lee A.
 Smith, Arthur D. a,b,c
 Smith, Justin G.
 Spendlove, J. Clifton
 Sprague, Roderick and Jack P. Meiners
 Stewart, George
 Stoddart, L. A., A. H. Holmgren, and
 C. W. Cook
 Tripp, George
 Wood, Stephen L.
 Woodbury, A. M.
 1950 Anonymous a,b,c
 Axelrod, Daniel I.
 Bleak, A. T.
 Bleak, A. T. and T. A. Phillips
 Burnham, Robert C.
 Chamberlin, Ralph V.
 Christensen, Earl M.
 Colbert, Francis Theodore
 Cook, C. Wayne and Lorin E. Harris
 Cook, C. Wayne and L. A. Stoddart
 Cook, C. Wayne, David O. Williamson,
 Lorin E. Harris, L. A. Stoddart, and
 L. L. Madsen
 Croft, A. R.
 Croft, A. R. and John A. Adams, Jr.
 Davidson, John F.
 DeVoto, Bernard
 Ewan, Joseph
 Frischknecht, Neil C.
 Gaufin, D. M. and others
 Grant, U. S.
 Gregory, Herbert E. a,b
 Harris, Lorin E., Neil C. Frischknecht,
 George Stewart, James A. Bennett, and
 Harry K. Woodward
 Hitchcock, A. S. and Agnes Chase
 Hitchcock, C. Leo
 Holmgren, A. H.
 Hubbert, Ferris E., Jr.
 Hutchings, Selar S. a,b
 Julander, Odell and W. Leslie Robinette
 Julander, Odell, W. L. Robinette, A. D.
 Smith, and D. M. Gaufin
 Keller, Wesley
 Kendeigh, S. Charles, *et al*
 Little, Elbert L., Jr.
 Lull, Howard W. and Lincoln Ellison
 Lull, H. W. and H. K. Orr
 Martin Floyd L.
 McKell, Cyrus M. a,b
 Mielke, James L.
 Monninger, L. V.
 Murie, Margaret E.
 Ortiz, Luis B.
 Parker, Robert E. a,b
 Parkey, Wade
 Plummer, A. Perry and J. M. Fenley
 Popov, Boris Hewitt and Jessop B. Low
 Preece, Sherman J., Jr. a,b
 Roe, Arthur L. and Kenneth N. Boe
 Samuelson, John A. a,b
 Schemel, Mart P.
 Schulman, Edmund a,b,c
 Shaw, Richard Joshua
 Smith, Arthur D. a,b,c,d
 Stevens, Kenneth R.
 Stewart, Charles James
 Stewart, George
 Stoddart, L. A. and C. W. Cook
 Tangren, W. E.
 Tingey, D. C.
 Tingey, D. C. and F. L. Timmons
 Tully, J. G., Jr., D. A. Anderson, and T. L.
 Martin
 Turner, George C., Jr.
 U. S. Dept Interior
 1951 Aldous, C. M.
 Alvey, Edson and James M. Gatherum
 Antrei, Albert C.
 Bailey, Reed W.
 Barneby, R. C.
 Billings, William Dwight
 Brewster, Wayne Winters
 Buss, Walter R.
 Cook, C. Wayne and L. A. Stoddart
 Cook, C. Wayne, L. A. Stoddart, and
 L. E. Harris
 Crane, Harold S. a,b
 Croft, A. R. and Marvin D. Hoover
 Dalton, Patrick Daly, Jr.
 Dunstan, William Albert
 Ellison, Lincoln, A. R. Croft, and Reed W.
 Bailey
 Fischer, George W.
 Frischknecht, Neil C.
 Gatherum, Gordon Elwood
 Green, L. R., L. A. Sharp, C. W. Cook,
 and L. E. Harris
 Greenwood, Lucile
 Houston, W. R.
 Hutchings, Selar S.
 Julander, Odell
 Julander, Odell, D. M. Gaufin, Arthur D.
 Smith, and W. Leslie Robinette
 Julander, Odell and W. Leslie Robinette
 Ling, Lee
 Lockerbie, Mrs. C. W. and William H.
 Behle

- Maguire, Bassett
 Maguire, Bassett and Arthur H. Holmgren
 Mangelson, Farrin L. and Arthur D. Smith
 McCullough, Robert A.
 Miller, Elbert Ernest
 Monk, Ralph and George Stewart
 Murdock, Joseph R.
 Murphy, Joseph R.
 Payne, Helen C. and Ruth L. Roche
 Rasmussen, D. I.
 Reimschuessel, Ernest F.
 Sampson, Arthur W.
 Schulman, Edmund
 Stewart, George
 Stoddart, L. A., Glen T. Baird, George
 Stewart, Ben S. Markham, and Howard
 Clegg
 Stoddart, L. A., Howard Clegg, Ben S.
 Markham, and George Stewart
 Stoddart, L. A. and C. Wayne Cook
 Stutz, Howard Coombs
 Tully, Joseph George
 Wingfield, Billy H.
 Wood, Stephen L.
 Worthington, Keith N.
 Wyman, Leland C. and Stuart K. Harris
- 1952 Allman, Verl Phillips
 Arnberger, Leslie P. and Jeanne R. Janish
 Barneby, R. C. a,b
 Cannon, Helen L.
 Cook, C. Wayne and Lorin E. Harris
 Cook, C. Wayne, L. A. Stoddart, and
 Lorin E. Harris
 Cook, C. Wayne, L. A. Stoddart, and
 Virgil L. Hart
 Cottam, Walter P.
 Cox, Hallie L.
 DeVoto, Bernard
 Diem, Kenneth Lee
 Ellison, Lincoln and C. M. Aldous
 Fireman, Milton and Hayward, H.E.
 Fireman, Milton and H. E. Hayward
 Flowers, S. a,b,c
 Hayward, C. Lynn
 Hill, Jerry W.
 Hitchcock, C. L.
 Hockmuth, H. R.
 Hubbard, Richard Loren
 Johnson, Clark D.
 Julander, Odell
 Katich, Philip Joseph, Jr.
 Kay, Lee
 Lankford, Robert Renninger
 Liechty, William R.
 Lofgren, B. F.
 Low, J. B.
 Marston, Richard B.
- McKnight, Kent Howell
 McMillan, Calvin
 Mielke, James L.
 Nielson, R. Lynn
 Payne, Helen C.
 Pendleton, R. C.
 Plummer, A. Perry and Neil C.
 Frischknecht
 Porter, C. L.
 Robinette, W. Leslie, Odell Julander, Jay
 S. Gashwiler, and Justin G. Smith
 Roche, Ruth L.
 Salisbury, Frank Boyer
 Sampson, Arthur W.
 Saul, William Emmett
 Smith, A. D. a,b
 Smith, Justin G.
 Stokes, W. L.
 Trueblood, Richard
 Vest, Edwin Dean
 Wolf, Kenneth E.
 Young, Orson Whitney
- 1953 Anonymous
 Abbott, Edwin Bruce
 Allman, Verl
 Backman, Gus P.
 Barneby, R. C.
 Cook, C. Wayne and L. A. Stoddart a,b,c
 Cook, C. Wayne, L. A. Stoddart, and
 Lorin E. Harris
 Cottam, Walter P. a,b
 Croft, A. R. and L. V. Monninger
 Dahl, Billie Eugene
 Flowers, Seville a,b
 Frischknecht, Neil C., Lorin E. Harris,
 and Harry K. Woodward
 Fuller, Robert Weeks
 Hart, Virgil Lee
 Hawksworth, Frank G.
 Hilmon, Junior B.
 Hutchings, Selar S. and George Stewart
 Jansen, Leonard L. and Eugene S. Cronin
 Julander, Odell
 Kollmorgen, Walter M.
 Linford, Ernest H.
 Little, Elbert L., Jr.
 McVaugh, Rogers
 Murdy, Horatio Williams
 Nelson, Noland F.
 Payne, Willis Reed
 Peattie, Donald Culrose
 Porter, C. L.
 Preece, S. J., Jr. and B. L. Turner
 Robinson, Max E. and Darrell H.
 Matthews
 Rognrud, Merle J.

- Saul, William Emmett and Seville Flowers
 Sigler, William F. a,b
 Smith, Arthur D.
 Smith, Glenn William
 Smith, Justin G. and Odell Julander
 Stoddart, L. A., C. W. Cook, and B. P. Gomm
 Tackle, David and D. I. Crossley
 Timmons, B. L. and W. O. Lee
 Tingey, D. C.
 Udy, Jay R.
 U. S. Congress, Senate Committee on Agriculture and Forestry
 Vest, E. Dean and W. P. Cottam
 Wardle, William Duane
 Wilson, F. Douglas
 1954 Anonymous a,b
 Ashman, Roland Bruce
 Baker, Virgil Raymond
 Barneby, R. C.
 Burkey, Naia H.
 Cook, C. Wayne
 Cook, C. Wayne, L. A. Stoddart, and L. E. Harris
 Cottam, Walter P.
 Crane, Harold
 Ellison, Lincoln
 Flowers, Seville a,b
 Hall, Heber Horace
 Hall, Heber H. and Walter P. Cottam
 Harrison, Bertrand F.
 Houston, Walter R.
 Hutchings, Selar S.
 Kendeigh, S. Charles
 Lemke, Armond Edwin
 Nelson, Noland F.
 Pechanec, Joseph H., George Stewart, A. Perry Plummer, Joseph H. Robertson, and A. C. Hull, Jr.
 Peterson, D. L.
 Salisbury, Frank B.
 Schulman, Edmund a,b,c
 Smith, Arthur D. and Richard L. Hubbard
 Tackle, David
 Tanner, Vasco M. and Gerald L. Nielsen
 Tingey, D. C. and C. Wayne Cook
 Trueblood, Richard Wayne
 U. S. Congress, House Committee on Interior and Insular Affairs
 Winters, Wayne Street
 Woodbury, A. M.
 Works Project Administration Writers' Program
 1955 Anonymous a,b,c
 Bailey, Virginia Long and Harold Edwards Bailey
 Behle, William H.
 Burton, Warren Hepburn, Jr.
 Castle, Elias Smith
 Christensen, Earl M.
 Cooke, William B.
 Cottam, Walter P. and Rudy Drobnick
 Dahlgren, Robert B.
 Deaver, Chester F. and Horace S. Haskell
 Denney, Alice
 Ellison, Lincoln
 Flook, Donald R.
 Flowers, Seville
 Frischknecht, Neil O. and A. Perry Plummer
 Gaufin, Arden R. a,b
 Gomm, Fred B.
 Hancock, Norman V.
 Iltis, Hugh H.
 Jones, Volney H.
 Julander, Odell a,b,c
 Krygier, James T.
 Lee, W. O. and F. L. Timmons
 Lewis, Harlan, and Margaret Ensign Lewis
 Lewis, Mont E.
 Lloyd, Russell Duane
 Marston, Richard B.
 McGinnies, W. G.
 Mills, John A.
 Nelson, Noland F. a,b,c
 Olsen, C. J.
 Olsen, Richard Louis
 Phillips, Hugh J.
 Phillips, Lyle L.
 Plummer, A. Perry, A. C. Hull, Jr., George Stewart, and Joseph H. Robertson
 Porter, Richard D.
 Robinson, M. E. and D. H. Matthews
 Saul, William Emmett
 Shippee, E. Allen
 Sigler, William F.
 Smith, Arthur D.
 Stoddart, Laurence A. and Arthur D. Smith
 Thatcher, Lynn M.
 Tillett, Stephen S.
 Tingey, D. C.
 Turner, Robert B.
 U. S. Dept. Interior
 University of Utah, Ecological Research a,b
 Vest, Dean
 Vickery, Robert K.
 West, Rolan
 Wingfield, Billy and Jessop B. Low
 Woodbury, A. M. a,b
 Woodbury, Lorraine
 Wormington, H. M.

- Young, Stanford a,b
 1956 Anonymous a,b,c
 Anderson, Russell D.
 Ball, Wilburn N.
 Barneby, R. C.
 Bateman, George Q. and Wesley Keller
 Bennett, John
 Camp, Harry W.
 Chatwin, Sterling Larry
 Christensen, Earl M.
 Clark, William J.
 Cook, C. Wayne
 Cook, C. Wayne, L. A. Stoddart, and
 Lorin E. Harris
 Cottam, Walter P. and John M. Tucker
 Darling, F. Fraser
 Daston, J. S.
 Ehrendorfer, Friedrich
 Enyeart, George W.
 Finn, L. E.
 Gates, Dillard H. a,b
 Gates, D. H., L. A. Stoddart, and C. W.
 Cook
 Chiselin, Jon Brewster
 Griffin, Gerald D.
 Griffin, Gerald D. and Don M. Rees
 Heaton, Vard H.
 Killpack, Merlin L.
 Mann, David H.
 McDonald, Donald B.
 McVaugh, Rogers
 Mitchell, James E.
 Nielson, Arlan Kent
 Oosting, Henry J.
 Pase, C. P.
 Quigley, Blaine Howard
 Rosa, J. M. and A. R. Croft
 Schulman, Edmund
 Shaw, Samuel P. and C. Gordon Fredine
 Sprague, Roderick
 Struble, Robert G. and A. R. Croft
 Tackle, David
 Utah Legislative Council
 Vickery, Robert K., Jr. a,b,c
 Vickery, Robert K., Jr. and Richard L.
 Olson
 Weigand, Edwin F.
 Witte Penlope
 Wolf, Kenneth E.
 Woodbury, A. M. a,b
 Young, William S.
 1957 Anonymous a,b,c
 Anderson, Russell D. and Don M. Rees
 Benson, Lyman a,b
 Christensen, Earl M.
 Cook, C. Wayne, L. A. Stoddart, and
 Lorin E. Harris
 Cronquist, Arthur
 DeBano, Leonard Francis
 Dunn, David B.
 Eardley, A. J., Vasal Gvosdetsky, and
 R. E. Marsell
 Ehrendorfer, F.
 Flannery, John S. a,b
 Flowers, Seville
 Gaines, Xerpha
 Gates, John M.
 Gaufin, Arden R.
 Harrison, Bertrand F.
 Harrison, Bertrand F. and Richard F.
 Nelson
 Hutchinson, S. Blair and John H.
 Wikstrom
 Imshaug, Henry A.
 Jones, Dale
 Kent, Kate Peck
 Kinsinger, Floyd E.
 Martin, Alex C., Roy C. Erickson, and
 John H. Steenis
 McConnell, William J., William J. Clark,
 and William F. Sigler
 McKnight, Kent H.
 Mielke, James L. a,b
 Mukherjee, Barid B., Delbert Wiens, and
 Robert K. Vickery, Jr.
 Nelson, Richard Folsom
 Orr, Howard K.
 Packer, Paul E.
 Peck, R. E.
 Plummer, A. Perry
 Plummer, A. Perry, Robert L. Jensen, and
 Homer D. Stapley
 Pratt, Gene A.
 Pratt, Gene A. and Kent H. McKnight
 Sarmiento, Roberto
 Smith, Arthur D. a,b
 Solheim, W. G.
 Speirs, Roy D.
 Speirs, Roy D. and Don M. Rees
 Stewart, George
 Thomas, Lindsey K., Jr.
 U. S. Dept. Interior, Water Resources
 Division
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Science Bulletin**

**BIRDS OF THE UPPER COLORADO
RIVER BASIN**

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by

C. LYNN HAYWARD



**BIOLOGICAL SERIES — VOLUME IX, NUMBER 2
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BIRDS OF THE UPPER COLORADO RIVER BASIN

by

C. Lynn Hayward*

INTRODUCTION

In 1958 the first of a proposed series of papers on the Zoology of the Upper Colorado River Basin was produced (Hayward, Beck, and Tanner, Brigham Young Univ. Sci. Bull., Biol. Ser. 1(3):1-74) in which the general ecological features of the area were described and a checklist of the known land vertebrates was published. It was proposed in that paper that additional reports would be forthcoming on the several animal groups of the area as information and time would permit.

The present paper is designed to bring up to date information we have been able to gather on the birdlife of the Upper Colorado Basin. During the interim since the last paper, certain important physical and biotic changes have been effected in the basin which seem to have resulted in important changes in the avifauna. Not the least important of these alterations is the creation of several large and many small reservoirs which have already produced important changes, especially in the aquatic and shorebird populations.

Evidence at hand indicates that the Colorado River and Green River have always served as important migratory routes for waterfowl and shorebirds, as well as smaller passerine birds. Twomey (1942) and his associates, who made their observations some 30 years ago in the Uinta Basin area, reported nearly all of the kinds of these groups now known to occur there either as transients or breeding residents. However, in Twomey's time and prior to the development of numerous reservoirs, particularly in the Uinta Basin, waterfowl depended almost entirely on the river and larger tributaries for resting and feeding while shorebirds worked along the sandy or muddy shores or on the limited floodplains of the streams.

Suitable nesting grounds for ducks were limited to a few small marshes near the mouths of some of the tributaries. With continued development of aquatic habitats in many parts of the basin, the status of the waterfowl and shorebirds throughout the entire area has changed materially over the past several years and should continue to improve as the newly

created lakes and reservoirs become better established.

A number of species considered by Twomey to be transients only or casual visitors in the Uinta Basin are now well established as breeding species. These include the Eared Grebe, Western Grebe, Pied-billed Grebe, Forster's Tern, Black Tern, Willet, Avocet, and Black-necked Stilt. Owing to more extensive and favorable nesting areas now available, the population of breeding ducks has expanded considerably in recent years. Twomey found only two breeding colonies of Yellow-headed Blackbirds in the Uinta Basin, with the principal colony being at Ashley Creek marshes. There are now large, additional colonies established at Pelican Lake and Montez Reservoir and at other sites throughout the basin.

The kinds of birds inhabiting the Upper Colorado River Basin have been rather well known for some time, although new records appear as fieldwork continues. For those interested in taxonomy on the subspecies level there may be some problems in clinal distribution through the extent of this large area. The presence of several rather isolated mountain ranges may also present problems of subspecific variation in certain resident species.

No attempt is to be made here to review all of the publication on upper basin birds, although the writer has attempted to prepare a fairly complete bibliography of the area. The earlier works of Twomey (1942) on the birds of the Uinta Basin and of Woodbury and Russell (1945) on the birds of the Navajo country have proved to be very valuable. In addition to these, the papers of Behle (1941, 1948, 1958a, 1958b, 1959, 1960) dealing directly with Upper Colorado Basin birds have been very useful sources. Several earlier writers published lists from portions of the basin in New Mexico, Colorado, and Wyoming. These include Copeland (1920), Fuller and Bole (1930), Gilman (1907), Knight (1902), Rockwell (1908), Warren (1908, 1909). The recent two-volume work of Bailey and Niedrach (1965) on the birds of Colorado has added considerably to our knowl-

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edge of the birds of western Colorado, although most of their records are for the Rocky Mountains and eastward.

The writer's own observations on the bird-life of the Upper Colorado River Basin have been mostly in the Utah portion of it with more general observations in other parts of the area. Part of the information on which this paper is based has come from the notes and published papers of my colleagues at Brigham Young University. I am especially indebted to Merlin L. Killpack, who has furnished much valuable information especially on the winter birds of the Uinta Basin and has published some notes on that area (Killpack, 1958, Hayward and Killpack, 1953, 1952, 1951). Herbert H. Frost and Joseph R. Murphy have kept records of birds seen by them on frequent trips to the Colorado River south of Moab. D Elden Beek has led several expeditions into south-central Utah and has given me full access to his notes. Through the kindness of Robert G. Bee I also have access to an unpublished list of birds recorded by Mildred E. Baker, a member of the Buffalo, New York, Audubon Society, while on a trip down the Green and Colorado Rivers from Green River, Wyoming, to Lake Mead from June 20 to August 23, 1940.

An account of some of the early explorations in the Upper Colorado River Basin, as well as a detailed statement of the work of Brigham Young University personnel in the area, has been published (Hayward, Beek, and Tanner, 1958). Fieldwork on the part of this writer has continued since that time with special emphasis being placed on the waterbirds and shorebirds.

With the completion of large dams on the Colorado River and its tributaries and the formation of extensive lakes, notably Lake Powell and the Flaming Gorge Reservoir, vast new areas have become accessible to the general public. Several national monuments in the basin have steadily grown in popularity and the new Canyon Lands National Park has recently been created.

All of these facilities will doubtlessly combine to produce one of the very great recreational areas and tourist attractions in the country within the next few years. The impact that this influx of humanity may have upon the biotic community cannot entirely be foreseen, but it is certain that many visitors will be interested in knowing something about the wildlife that they see about them. Our previous paper (*op. cit.*, 1958) may be of interest in that respect, since there are diagrams showing the community re-

lationships of some of the more common mammals, reptiles, and birds. It is hoped that the present paper, dealing in more detail with birds, may prove to be of some value to the general public as well as to those interested in the more technical aspects of the ornithology of the area.

The plan of the paper is to present first of all a picture of the birdlife of the principal habitats found in the Upper Colorado River Basin for the benefit of those who may visit the streams and reservoirs, the open plains and desert country, or the canyon lands. An account is also given of the seasonal aspects of bird populations in the area. In these parts of the paper the birds will be referred to by the common names as proposed in the Fifth Edition (1957) of the A. O. U. Checklist of North American Birds.

Following the more or less popular account will be an annotated list of the kinds of birds known to the writer from the area. The nomenclature in this list follows the several volumes of Peters' *Birds of the World* insofar as that work has been completed to the present time. For those families lacking in that treatise, the A.O.U. Checklist is, for the most part, used as the authority. No attempt is made to cite all the published records, except in cases where I have not observed the birds directly, or where their occurrence is rare. Subspecific names, in the main, are included principally on the basis of the known distribution of the several forms rather than on a critical study of museum specimens since in most cases we lack sufficient series to permit such a study.

The account given pertains to birds living in the basin floor and foothills and does not include those of the montane forests and alpine that rim the basin, except for those montane species that are known to winter at lower elevations or pass through as migrants. In terms of our previous report (1958) on the upper basin the present paper includes the resident and transient birds found in the cottonwood-willow-tamarisk floodplain, northern desert shrub, and piñon-juniper woodland communities along with the several types of aquatic communities found therein.

The writer has rather little firsthand information on the birds of the upper reaches of the San Juan River in New Mexico, the Dolores, Gunnison, Colorado, White and Yampa Rivers in Colorado, and the Green River in Wyoming. It has been necessary to rely mostly on the literature for information on the birds of those areas.

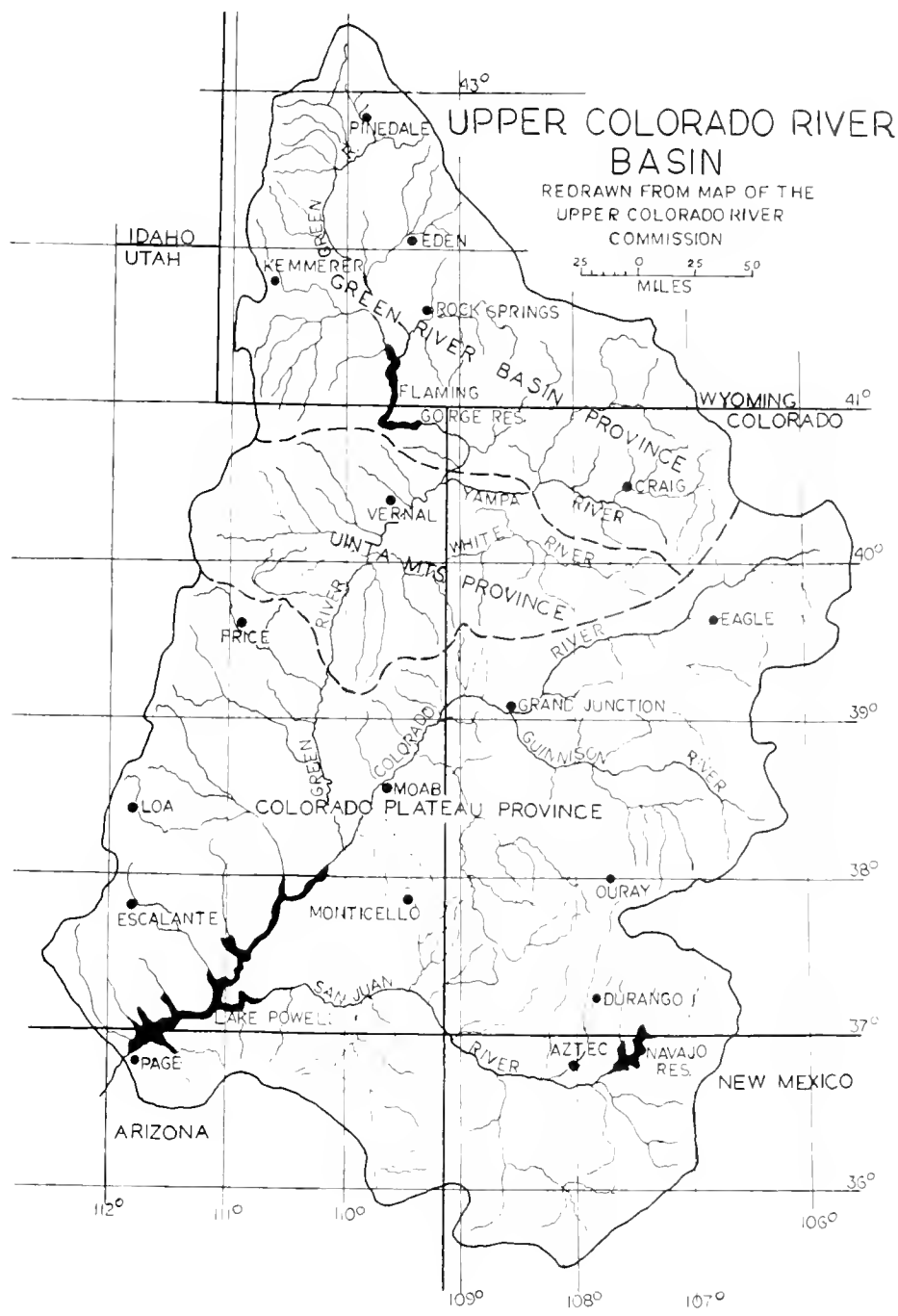


Fig. 1. Drainage system and geographical provinces of the Upper Colorado River Basin.

BIRD HABITATS OF THE UPPER COLORADO RIVER BASIN

As stated previously the cottonwood-willow-tamarisk, northern desert shrub, and piñon-juniper woodland in a broad sense constitute the land communities of the Upper Colorado River Basin. In a consideration of the birds of the area the aquatic communities should be added. These include the rivers and their major tributaries, of which many cross the basin, and the reservoirs, several of which have been impounded in comparatively recent years. The latter are no less important to waterfowl and shorebirds than they are to fish; and will, no doubt, under proper management become more important as time goes on. In the following account it is the aim to discuss the more common birds likely to be encountered by interested visitors to the area. With the aid of any of several good field guides to birds, especially *A Field Guide to Western Birds* (Houghton-Mifflin Company, Boston, 1961), an interested person should be able to easily identify many of the larger birds, at least, that are more likely to be seen in the several habitats; and the habitats themselves are not difficult to recognize.

BIRDS OF THE FLOWING STREAMS AND THEIR BORDERS

An examination of a map of the upper basin (Fig. 1) impresses one with the numerous streams that arise in the bordering mountains and pass through the lower elevations of the basin. The Green River, which receives many of these tributaries, flows southward from its origin in the high mountains rimming the northern part of the Green River Basin Province to its union with the Colorado River in southeastern Utah. These two large streams join together near the upper limits of the newly created Lake Powell.

Throughout much of their courses these two streams and some of their larger tributaries flow at a rather slow rate through fairly level country; but in places, especially where they pass through canyon country, there are rapids of considerable magnitude. In the slower portions of the streams most any of the water birds are likely to be seen in small flocks or as individuals. The Canada Goose is one of the most common species and family groups consisting of a pair, and their young are often seen in summer. Certain species of ducks more likely to inhabit rivers include the Red-breasted and Common Mergansers and the Common Goldeneye.

In certain areas small, quiet estuaries occur near the main stream, forming small ponds that

may or may not remain connected with the river. If these ponds are fairly stable, emergent vegetation and other aquatic plants may become established forming a suitable habitat for several kinds of dabbling ducks including the Mallard, Pintail, and Cinnamon Teal. Coots are also frequent inhabitants of these ponds. Around the borders of the ponds as well as along the sandy banks of the streams themselves several kinds of wading birds and shorebirds may occur. The Great Blue Heron is one of the more common of these and the Killdeer and Spotted Sandpiper are also frequently seen. Most any of the transient shorebirds as well as casual visitors may be found in April and May and again in late July, August, and September resting on the banks or feeding in shallow water. These include such species as the Solitary Sandpiper, Least and Western Sandpipers, Avocet, Black-necked Stilt, and California and Ring-billed Gulls. The Dipper is sometimes seen on rocks bordering the stream or in midstream, especially in tributaries where there are rapids.

BIRDS OF THE RESERVOIRS AND MARSHES

Probably all of the reservoirs (some are called lakes) to be found in the basin are of artificial origin designed to produce electric power or for the irrigation of adjacent land. Incidental to this, but of considerable importance, is their use for purposes of recreation. Certain ones of these, for example the Stewart Lake Refuge near Jensen, Utah, have been created solely for the protection and propagation of waterfowl.

The value of these bodies of water in relation to the birdlife of the area is yet to be determined since many of them have only recently been formed. Owing to the fluctuation in water level in these reservoirs from season to season and from year to year, the establishment of stable habitats for the nesting and feeding needs of waterfowl is not likely to be very successful. At the present time two sorts of aquatic communities occur in the upper basin. The larger reservoirs such as Lake Powell and Flaming Gorge are newly formed and their usefulness to waterfowl is limited mainly as places of temporary refuge and rest for transient birds. As time goes on, certain shallow bays of these reservoirs, provided they enjoy some degree of stability in water level, should develop emergent vegetation and increase the availability of food and cover which is now almost entirely lacking.



Fig. 2. Pelican Lake, Uintah County, Utah. This shallow lake, which is artificially formed, is rich in animal and plant food and is a favored feeding area for spring, summer, and autumn migrating shore-birds and waterfowl. Photo by C. L. Hayward.



Fig. 3. Avocets feeding at Pelican Lake, Uintah County, Utah, May 15, 1966. Photo by C. L. Hayward.

A second type of aquatic habitat is seen in smaller ponds and reservoirs, of which there are many of a variety of sizes and in several stages of development. A good example of this type is seen in a shallow body of water in Uintah County, Utah, known as Pelican Lake. This lake is rapidly developing into an important area for a variety of waterfowl, wading birds, and shorebirds. While there is considerable fluctuation in its shoreline it supports an excellent growth of submerged and floating vegetation, and emergent plants are beginning to come in around its borders. Animal and plant food available to the birds is in abundance. The lake is rather isolated and seems to be little disturbed during the critical breeding season.

A description of the birdlife at Pelican Lake is herein used as an example of what the visitor would be likely to see during the open-water season at a fairly well-established lake or reservoir in the Upper Basin. In the open water of the lake, the Western Grebe and Eared Grebe are common throughout the summer as is the American Coot. Almost all kinds of ducks found in the general area may be seen there at times during the summer. The more common of these include the Mallard, Pintail, Gadwall, Cinnamon, Blue-winged and Green-winged Teal, and Shoveler. Canada Geese also utilize the open water of the lake, especially in later summer and autumn. The California Gull, Ring-billed Gull, Franklin's Gull, Forster's Tern, and Black Tern rest and feed on the open water; and the last two species nest in the area.

Around the borders of the lake the Great Blue Heron, Snowy Egret, and White-faced Ibis occur in small numbers. Common summer-resident shorebirds include the American Avocet, Black-necked Stilt, Willet, and Killdeer. A variety of migrant shorebirds stop in May and late summer to feed on the abundant aquatic life around the shallow borders. These include the Least and Western Sandpipers, Greater and Lesser Yellowlegs, Long-billed Dowitcher, Wilson's and Northern Phalaropes, Sanderlings, and Baird's Sandpiper. The Black-bellied Plover and Semipalmated Plover are also frequently seen and the Golden Plover appears rarely.

Long-billed Marsh Wrens, Yellow-headed Blackbirds, and Red-winged Blackbirds nest in the emergent vegetation around the borders; and several kinds of swallows, especially Cliff Swallows, feed on the abundant midges over the water and shores. The Common Nighthawk also concentrates its feeding in a similar way. Wintering Water Pipits feed along the shore close to

the water or even in the water itself in early spring and late fall. Horned Larks, common in surrounding deserts, feed on insects from the surface of the water.

BIRDS OF THE COTTONWOOD-WILLOW-TAMERISK

Bordering most of the streams, both large and small, there is usually a woodland zone of trees and taller shrubs. In places where walls of rock rise abruptly from the stream this border is lacking or very narrow. In other places where there is a small but distinct floodplain small groves of trees or sometimes single trees occur. In side canyons adjacent to the streams, the woodland or a dense growth of shrubs may occur wherever there is a small tributary or a little water seepage. This latter type is particularly characteristic of the canyon country of the Colorado Plateau Province. In the broader valleys or plains, especially in the northern parts of the basin, there may be a fairly wide zone of woodland with groves of cottonwoods predominant. The lower and wetter parts of these are frequently used as pasture lands while the higher alluvial soils are usually under cultivation. Small towns or ranches occur at intervals in these areas. In many places the cultivation of the land and the institution of irrigation have resulted in the expansion of trees and shrubs beyond their natural limits along the streams. This results in additional habitat areas that are no doubt advantageous to many kinds of smaller birds.

From the point of view of the number of birds, these floodplain woodlands support the richest avifauna of any of the habitats of the upper basin. Not only is there an important breeding population of birds, but this community serves as a vital passageway for many migrating species. The availability of some cover and food also makes it an important habitat for wintering species.

The birdlife of the floodplain woodlands may be described by dealing with the several habitat niches occupied by the more common species. While many of these niches overlap, the principal ones are exemplified by (1) birds depending on holes in trees for nesting sites and feeding from the trunks and limbs of trees or larger shrubs; (2) birds using holes as nesting and roosting sites but feeding elsewhere; (3) birds using the branches of trees as nesting sites but feeding elsewhere; (4) species using limbs and branches as nesting sites and feeding from foliage of the trees; (5) transient species feeding from the foliage; (6) species using the



Fig. 4. Cottonwood-willow-tamarisk woodland (riparian) community partially put to agricultural use near Fruita, Wayne County, Utah. Photo by D. E. Beck.



Fig. 5. Small agricultural community of Henrieville, Garfield County, Utah, surrounded by desert shrub and cliff habitats. Photo by C. L. Hayward.



Fig. 6. Natural cotton-willow-tamarisk woodland (riparian) on White River near Bonanza, Uintah County, Utah. Photo by C. L. Hayward.

trees as roosting or lookout sites but feeding and nesting elsewhere; (7) birds using the shrubby vegetation for cover and nesting, and feeding either from the shrubs themselves or from the ground nearby; (8) transient and wintering species using the shrubs for refuge and sometimes feeding from them; (9) primarily ground-dwelling species using the trees principally for refuge or roosting; (10) birds of open fields and pasturelands often using fence posts, utility posts, or nearby trees and shrubs for perching.

In areas along the streams where the floodplains are rather broad, groves of cottonwoods and other trees, some of which are dead but still standing, afford nesting and roosting sites for several species of birds that feed also from the trunks and branches of the trees. The Red-shafted Flicker is one of the more common of these although this species also frequently feeds on the ground. Several other woodpeckers are also present including Lewis' Woodpecker and occasionally the Red-headed Woodpecker, both of which occur on the floodplains of the Green

River. Along the upper reaches of the Green River and its tributaries the Yellow-bellied Sapsucker is very common nesting in the stream woodlands. Downy and Hairy Woodpeckers are also present. The Black-capped Chickadee, White-breasted Nuthatch, Red-breasted Nuthatch, and House Wren would also be included in this category.

Several kinds of birds utilize holes in the trees for nesting and roosting but do not feed directly from the trees. The Screech Owl and Pygmy Owl would be examples. The recently invading Starling, the Tree Swallow, and the Mountain Bluebird as well as the Sparrow Hawk would also be representative of this group. The Sparrow Hawk is very conspicuous along most of the waterways of the upper basin, but this species also nests commonly in the canyon ledges.

Many species use limbs and smaller branches as nesting sites but obtain most or all of their food elsewhere. These include several species of hawks and owls such as the Red-tailed Hawk, the Goshawk, Cooper's Hawk, Sharp-shinned



Fig. 7. Green River near site of Flaming Gorge Dam, showing narrow floodplain and absence of woodland owing to the steep walls of the canyon. This is typical of much of the canyonland country. Pinyon-juniper on surrounding area. Photo by D. E. Beck.

Hawk, and Long-eared Owl. A number of the flycatchers such as the Western and Cassin's Kingbirds, Eastern Kingbird, and Western Wood Pewee would also come under this category. Several of the other passerine species construct their nests in trees but feed principally elsewhere. Included in this group would be the Common Crow, especially in the Green River Basin Province; the Black-billed Magpie; and the Robin. A few species use the limbs as nesting sites and gain most of their food from the trees themselves. The Yellow Warbler, Warbling Vireo, Red-eyed Vireo, Solitary Vireo, Bullock's Oriole, and Black-headed Grosbeak are representative.

Many of the transient small birds follow along the wooded floodplains in spring and autumn and feed from the foliage. Several species of warblers, the most conspicuous being Audubon's Warbler, may be seen at appropriate seasons. Wilson's Warbler is also common, especially in spring and fall as is also the Western Tanager. These last two species also frequently feed in tall, shrubby vegetation. Several

thrushes, including Swainson's Thrush and the Hermit Thrush, often appear as transients.

A few species use the floodplain trees as lookout or roosting sites only. An example would be seen in the case of the Common Nighthawk. These birds frequently roost by day on horizontal limbs of the trees where they are very inconspicuous. Sometimes the dead or even living trees are utilized as roosting sites by the Turkey Vulture, which is seen in small flocks or singly roosting by night on such trees. These birds usually nest in caves.

The tall, shrubby vegetation growing in association with the larger trees on the floodplains affords a habitat for many birds. These shrubs include several kinds of willows, and the tamarisk, alder, birch, squawberry, and hawthorn. Most of the birds that nest in this habitat feed in part at least from the ground. The Song Sparrow is perhaps the most common but the Scrub Jay, Traill's Flycatcher, Yellowthroat (near water), Yellow-breasted Chat, Catbird, Rufous-sided Towhee, Green-tailed Towhee, Brewer's Blackbird, and Black-chinned Hum-

mingbird are also present. In the more southern parts of the basin the Blue Grosbeak and Mockingbird are often seen in this habitat. In winter and during migration a number of species utilize the shrubs for refuge or as a source of food. Perhaps the most conspicuous of these would be the flocks of White-crowned Sparrows and Juncos that feed principally on the ground but use the shrubs for cover and refuge.

A few kinds of birds are principally ground dwellers and utilize the trees and shrubs for temporary refuge or roosting. The Mourning Dove is in large part a ground dweller, but it also nests in trees or shrubs and uses the latter for perching. The Ring-necked Pheasant, California Quail, and Gambel's Quail nest on the ground, but may roost or seek refuge in the taller vegetation. A few passerine birds including the Green-tailed and Rufous-sided Towhees often nest on the ground and feed there.

The natural pastures and cultivated fields of the floodplains representing more open habitats are frequently used as feeding grounds and even nesting places for many of the woodland dwelling birds. The Western Meadowlark nests on the ground in the pastures and fields but fre-

quently perches on posts or trees. Robins, Brewer's Blackbird, Starling, Common Crow, and Magpie are birds most commonly seen feeding in the open areas. The Savannah Sparrow is also a common pastureland bird.

BIRDS OF THE DESERT SHRUB AND CANYON HABITATS

The desert shrub communities occupy the higher and drier ground where the only natural source of moisture is the precipitation that falls as rain or snow. The greater part of this moisture comes in fall and winter. In the Green River Basin Province the general aspect of the country is less rugged with flat or rolling country and low hills broken only by streams. While some of the land is being used for dry farming most of it is utilized for grazing of livestock and much of it is overgrazed. Sagebrush is the predominant shrub in this area.

The desert shrub communities of the Uinta Mountains Province occupy a relatively small area in the Uinta Basin of Utah and extend eastward into Colorado principally along the drainage of the White River. A considerable amount of the land in the Uinta Basin of Utah has been



Fig. 8. Devil's Garden area in Arches National Monument, Grand County, Utah, showing monument-like rock formations with desert shrub and scattered pinyon-jumper communities. Photo by D. E. Beck.



Fig. 9. Monument-like formations and desert shrubs with scattered patches of pinyon-juniper at Balanced Rock Arches National Monument, Utah. Photo by D. E. Beck.

developed for agriculture at lower elevations and contains many of the elements of the flood-plain woodland avifauna. The foothills on either side of it and the plains to the eastward support several types of desert shrub communities. In some areas there are barren badlands with scarcely any vegetation at all, and in other sections the streams have cut deep canyons resulting in an uneven and broken country where there is much exposed rock.

The Colorado Plateau Province presents a strikingly different picture with respect to the appearance of the desert shrub communities. While there are some rather extensive plains where shadscale, sagebrush, or other shrubs occur in a more or less unbroken expanse, much of the country is extremely rugged with numerous deep canyons, sheer rock walls, tumbled rock masses, and spires of rock standing in open country. The shrubby vegetation occupies narrow ledges and dry valleys in patches of variable size, consisting of a variety of species depending upon the nature of the soil and other factors.

Birds that live in the shrub communities are

comparatively few in kinds but may be abundant as individuals. The particular kinds that occur throughout the upper basin seem to be somewhat limited by the gradient in climate from one end of the basin to the other—perhaps more so than the birds of other habitats so far discussed.

In the sagebrush plains country, particularly in Wyoming and northwestern Colorado, the Sage Grouse was formerly the most conspicuous and spectacular bird. Under protection these birds are still fairly common in certain areas. They are naturally strictly birds of open country depending on their protective colors and the shrubby habitat. In April the males appear in breeding plumage in flocks on favored strutting grounds where mating takes place and the females then nest in the near vicinity. Usually these birds tend to concentrate around springs and small streams and their numbers appear to be greater than they actually are, considering the extent of the surrounding country.

Other common birds of the desert shrub include the Vesper Sparrow, Brewer's Sparrow, Lark Sparrow, Sage Sparrow, Black-throated



Fig. 10. Typical desert wash near Moab, Grand County, Utah, dry except at times of irregular flooding. Sparse desert shrub in adjacent areas. La Sal Mountains in background. Photo by D. E. Beck.



Fig. 11. Sagebrush plains near Kanab, Kane County, Utah, typical of much of the flat, open country of the Upper Colorado River Basin. Photo by D. E. Beck.

Sparrow, and Green-tailed Towhee. The Vesper Sparrow is particularly characteristic of the sagebrush communities of Wyoming and Colorado while the Black-throated Sparrow is the most conspicuous species in the warmer southern portions of the basin.

The Sage Thrasher is very characteristic over the entire upper basin and the Mockingbird is found rather commonly especially in greasewood and tall sage communities of the southern part. The Common Nighthawk and the Poor-will nest usually on low exposed ridges, but the former species may roost in trees. Burrowing Owls occur especially in prairie dog towns or where there is an abundance of ground squirrels. Say's Phoebe is frequently seen in desert shrub communities where it perches on the taller shrubs, but there are usually old buildings or rocky ledges available to serve as nesting sites. The Loggerhead Shrike is another characteristic species of the desert shrub communities.

Possibly the most widespread and common bird of the desert shrub is the Horned Lark. This species is often seen in large flocks most of the year, especially along roadways and in more open country where the shrubs are lower in growth form and more scattered. In winter Horned Larks appear in immense flocks where food is exposed and such flocks may also contain a few other species including the Lapland Longspur and Snow Bunting. Flocks of Juncos and

White-crowned Sparrows also appear in the desert shrub during the winter.

The sheer cliffs, rock piles, and spires so characteristic of the canyon lands country of the Colorado Plateau afford nesting and lookout sites for a unique group of birds. Several of the hawks that occur in the area may use the cliffs and spires for such purposes. These include the Golden and Bald Eagles, Red-tailed Hawk, Rough-legged Hawk, Prairie Falcon, and Sparrow Hawk. The Raven is another common species that nests in the canyon ledges. Both the White-throated Swift and the Black Swift (the latter apparently more common at higher elevations) use crevices in the high cliffs as nesting and roosting sites. Cliff Swallows frequently occur in nesting colonies and build their mud nests under overhanging ledges. The Rock Wren and Canyon Wren are common inhabitants of rock piles. A few species sometimes use the cliffs as nesting sites, although they may also nest elsewhere. These include the House Finch, Say's Phoebe, and the Broad-tailed Hummingbird.

BIRDS OF THE PINYON-JUNIPER WOODLAND

The Pinyon-Juniper Woodland is particularly well represented in the Uinta Mountains and Colorado River Provinces. It occupies somewhat higher elevations than the desert shrub communities and appears on foothills or on low plateaus. In certain areas it is broken into small segments or patches by canyons or washes, but



Fig. 12. Extensive pinyon-juniper woodland near Natural Bridges National Monument, San Juan County, Utah. This community is particularly characteristic of flat mesas and broad valleys of the Uinta Mountains and Colorado Plateau Provinces. Photo by D. E. Beck.

on more even terrace it occurs as extensive and continuous forests.

Owing to the desert condition of this community and the uniform vegetation, bird life is comparatively sparse. However, the few species that do occur there are very distinctive. The Pinyon Jay is perhaps the most common and conspicuous species. It appears mostly as loose flocks passing through an area and stopping to feed for brief periods in the trees or on the ground. Sometimes long strings of the jays will

fly over, calling as they go. The Scrub Jay is also found in this community, although less commonly than the Pinyon Jay.

Several kinds of small passerine birds are very characteristic of the Pinyon-Juniper. These include the Plain Titmouse, Black-throated Gray Warbler, Blue-gray Gnatcatcher, Bewick's Wren, Gray Flycatcher, Ash-throated Flycatcher, Gray Vireo, White-breasted Nuthatch, and Hairy Woodpecker.



Fig. 13. Pinyon-juniper-yellow pine habitat near Flaming Gorge, Daggett Co., Utah. Photo by D E. Beck.

SEASONAL ASPECTS OF BIRD POPULATIONS

The large area covered by the Upper Colorado River Basin extends over a north-south distance of about eight degrees of latitude and presents a considerable range of climatic conditions. Most of the Green River Basin Province lies above 6,000 feet in elevation. The Uinta Mountains Province ranges between 5,000 and 6,000 feet. Much of the Colorado Plateau Province is above 5,000 feet, but extends a few hundred feet below that along the rivers in the southern parts of the province.

Winters in the Green River Basin Province are long and severe, often with long periods of sub-zero temperatures and cold winds over the open country. In years of normal precipitation snow accumulates and covers the ground for an extended period, and most of the lakes and streams freeze over. Summers are short and cool, and freezing temperatures are not uncommon even in midsummer.

The Uinta Mountains Province is characterized by extremes of climate. Winters are long

and cold with frequent sub-zero temperatures. Summer's daytime temperatures are hot with the maximum ranging into the 90's and above. Nights, however, are usually cool.

Southward in the Colorado Plateau Province the winter climate is somewhat more mild. Snow falls, but usually does not stay for long periods, and in the canyon bottoms where there is protection from the wind and where there is some reflection of the sun's heat from the canyon walls, winter conditions are rather pleasant. The summers in this province are hot and dry, and while the nights are usually cool, there is rarely any frost at this season.

Precipitation comes to the upper basin mainly in the winter months from November through March. Summer days are usually fair, but in late summer and early fall there may be rather regular but localized thunder showers, especially in the mountain ranges and within the basin. These showers do not always reach the lowlands, but their effects may be seen in flash floods that sweep along the desert washes from the higher elevations.

The winter aspect of bird populations in the upper basin varies considerably from one end of it to the other. In the Green River Basin Province where snow normally lies on the ground for a long period of time, the winter aspect continues roughly from the first of October until the first of May. During this period ducks and geese inhabit the area as long as there is any open water, but largely disappear from it in the dead of winter when most of the water bodies are frozen over. The principal winter inhabitants, therefore, consist of the permanent residents such as owls, some hawks, magpies, woodpeckers, and chickadees, horned larks, and starlings.

In addition to these permanent residents a number of species that breed in surrounding mountains or farther north may be found in winter populations inhabiting the Green River Basin Province. These include Steller's Jay, Townsend's Solitaire, Pine Grosbeak, Common Redpoll, several kinds of juncos, Pine Siskin, Tree Sparrow, White-crowned Sparrow, Lapland Longspur, and Snow Bunting. All of these birds are rather well adapted to severe winter conditions and are able to gain a food supply as predators, scavengers, tree feeders, or from the seeds of plants that may be exposed and available above the snow. However, prolonged blizzards, unusually deep snow, and long periods of exposure to sub-zero temperatures often make winter habitation extremely hazardous.

In the Uinta Mountains Province wintering conditions for the birds are similar to those mentioned above although they may be shortened by a few weeks, especially in autumn. There is likely to be somewhat less snowfall, and the ground may be exposed longer for the advantage of the ground-feeding species.

The Colorado Plateau Province is still more advantageous to wintering birds. Not only is food more available during the winter, but the lower elevations along the rivers and the protection afforded by the broken nature of the country provide more favorable conditions for a variety of wintering species. Large flocks of juncos, pine siskins, goldfinches, and western bluebirds occur. Several species inhabiting Pinon-Juniper are present including the Pinon Jay, Scrub Jay, Plain Titmouse, and Common Bush-tit.

In the Colorado Plateau Province most of the streams and some of the ponds and estuaries remain open throughout the winter. Some of the ducks, including the Common Goldeneye, Mallard, and Common Merganser, are found there throughout the winter. The Common Snipe, Killdeer, and Water Pipit also remain around small open ponds and estuaries. A few species of birds unable to withstand the winters of the more northern provinces may winter in the southern parts of the Colorado Plateau Province. These include the Turkey Vulture, Sparrow Hawk, Mountain Bluebird, and Mourning Dove.

Throughout most of the Upper Colorado River Basin the winter aspect of bird populations remains intact for the most part until the first of May, and a number of the wintering species linger well into the latter month. The months of April and May are likely to be periods of weather instability with cold and stormy fronts alternating with periods of fair and warming weather. Some of the permanent residents such as the Golden Eagle, Red-tailed Hawk, Ferruginous Hawk, Great Horned Owl, Sage Grouse, and Magpie may begin nesting or at least mating activities in April or even late March. As open water becomes available, ducks and geese begin northward migrations also in March and April.

The bulk of the shore and passerine bird migration takes place in late April and May. Judging from the information at hand, the spring shorebird migration passes through the Colorado Plateau and Uinta Mountains Provinces and then crosses the Wasatch Mountains

westward to join the Great Basin migrants in the valleys of Utah Lake and the Great Salt Lake. There is no evidence available to me that there is any extensive shorebird migration through the Green River Basin. In two visits to this area at the height of spring migration I have failed to see any but the locally nesting species of shorebirds; however, further observations may show otherwise.

Spring migration of the passerine birds takes place in late April and throughout May. The migration of several species of swallows is most conspicuous since they feed in large (often mixed) flocks along the banks of the rivers, ponds, and reservoirs. They appear in the southern part of the basin in the latter half of April and their flights continue through most of May. Species most likely to be seen in these flights are the Violet-green Swallow, Cliff Swallow, Rough-winged Swallow, and Barn Swallow. Most of the wood warbler migration seems to take place in May except that Audubon's Warbler may arrive in late April. The Yellow Warbler likely arrives in the southern part of the basin about May 1, and progresses northward over a period of about three weeks or a month. On a visit to the northern part of the basin on May 14, I failed to find the Yellow Warbler present but by May 27 it was abundant. Some of the wintering birds, especially juncos and White-crowned Sparrows, do not leave the basin until late May or early June. Other migrant species such as the Western Tanager and Wilson's

Warbler may still be passing through the basin in early June.

The period from the second week in June until mid-September, marked by hot and dry weather, affords the most favorable conditions for growth of the young of permanent resident birds hatched earlier and for the nesting and rearing of the young of most of the summer resident species. In late July and August birds prone to flock tend to converge on agricultural communities where there is more food. These include the several species of blackbirds and the Mourning Dove. Some species, such as the Green-tailed Towhee and Sparrow Hawk, may ascend to higher elevations where there is also an abundance of food and the weather is cooler. A number of kinds of shorebirds such as the Long-billed Dowitcher, Lesser Yellowlegs, Solitary Sandpiper and Western Sandpiper that nest in the far north appear in the upper basin in late July. Some of these may be nonbreeding birds that have remained all summer, but there is no doubt some arrival of migrants at this season. The bulk of the shorebird migration, however, occurs in late August and early September. A few individuals may remain into early October.

In September small migrant passerine birds occur in the basin particularly in the woodlands of the stream floodplains. These include Wilson's Warbler, Orange-crowned Warbler, Townsend's Warbler, Red-eyed Vireo, Solitary Vireo, juncos of several kinds, and White-crowned Sparrows.

ACCOUNTS OF THE SPECIES

Gavia immer (Brünnich)

Common Loon

Only scattered records are available for the upper basin. Twomey (1942:366) reports seeing them on the Green River near Jensen, May 5 and September 28, 1937. Behle (1958:38 and 1960:20) reports their occurrence at Kane County, April 24, 1931, and near Moab, Grand County, December 22, 1955. Bailey and Niedrach (1965:72) report records for Sweetwater Lake, Garfield County and Tomichi Creek, Gunnison County, Colorado. As far as is known they are entirely transient through the basin. Judging from specimens taken in other parts of the Intermountain West the subspecies *classon* Bishop is most likely to be found. With the creation of

several large reservoirs in recent years it may be expected that there will be an increase in the number of transient loons.

Podiceps caspicus californicus Heerman

Eared Grebe

This grebe undoubtedly occurs throughout the basin where there are suitable habitats. Records are published for Mesa County, Colorado (Rockwell, 1908:26); Sweetwater County, Wyoming (Knight, 1902:26); the Uinta Basin of Utah (Twomey 1942:367); and Kanab, Kane County, Utah (Behle *et al.* 1958b:38). All of the published records are for May and June, but the writer has found them to be common on Pelican Lake, Uintah County, Utah, from mid-

May until late July. Nests have not been found, but mating displays are frequently observed in early June. The Eared Grebe prefers shallow but open water and is likely to increase in abundance around the shallow shores of the newly created reservoirs.

Aechmophorus occidentalis (Lawrence)

Western Grebe

The Western Grebe has not been reported often from the basin area. Twomey (1942:367) recorded collecting one south of Jensen, Uintah County, May 4, 1937, and Behle (1960a:21) sighted one at Glen Canyon. The writer has seen them frequently at Pelican Lake, Uintah County, in company with Eared and Pied-billed Grebes. At this locality courtship activity was noted May 18, 1963, and May 15, 1966, but no nests have been located. Other dates of observation at Pelican Lake include May 13, 1961, and June 3, 1964, and September 19, 1956. On the latter date they were abundant. These birds seem to prefer open water of lakes and larger streams for feeding but require shallow shores with emergent vegetation for nesting. It is likely that they will increase as breeding birds on the reservoirs of the basin as vegetation becomes established around their borders.

Podilymbus podiceps (Linnaeus)

Pied-billed Grebe

The only records for this species available to me are from the Utah portion of the upper basin. Twomey (1942:367) collected it near Jensen, Uintah County, May 25, 1935, and Behle (1958b:38) recorded it from several localities in the vicinity of Kanab, Kane County, with dates of May 3, 1931, and July 10, 1940. The writer found them common at Pelican Lake, Uintah County, June 17, 1958, when they were in pairs and again July 22, 1961. Bailey and Niedrach (1965:82) report that this grebe is rare in Colorado west of the continental divide.

Pelecanus erythrorhynchos Gmelin

White Pelican

The White Pelican is likely to be seen as a nonbreeding resident or transient on any of the larger streams or reservoirs of the basin. It has been reported from near Jensen, May 12, 1937, by Twomey (1942:368), at Rock Creek on the Colorado River in Kane County by Woodbury and Russell (1942:27), at Grand Junction on the Colorado River, September 4, 1904, by Rock-

well (1908:157), and near Kanab, April 10, 1935, by Behle (1958b:38). While the writer has visited Pelican Lake many times he has seen the White Pelican on only one occasion, May 19, 1963, when a single bird was noted.

Pelecanus occidentalis Linnaeus

Brown Pelican

A single specimen was seen at Pelican Lake, May 19, 1963. An account of this discovery has been previously published (Hayward, 1966:305).

Phalacrocorax auritus auritus (Lesson)

Double-crested Cormorant

The Double-crested Cormorant appears to be an uncommon transient in the basin and there are only scattered reports of its occurrence. Twomey (1942:268) noted seven birds on Green River, Uintah County, May 15, 1935; McCrimmon (1928:368) records it from Montrose, Colorado, and Behle (1958:38) has reported it from Kanab, Utah, April 21, 1931. The writer has found it rather uncommon at Pelican Lake, Uintah County, Utah. Six birds were noted there July 22, 1961, and a small flock was seen May 18, 1963.

Some earlier accounts indicate that the Pacific race *albovittatus* occurred in Utah at least (AOU Checklist, 1931, p. 23 and Peters, Checklist of Birds of the World, Vol. 1, p. 86, 1931). Behle (1936:76), however, was able to show that the Utah specimens are closer to the eastern race *auritus* and they have since been so considered.

Ardea herodias treganzai Court

Great Blue Heron

The Great Blue Heron is a common species throughout the entire Upper Colorado River Basin where it is to be seen along the principal streams and about the borders of lakes and reservoirs. About 50 published and sight records are available to the writer. Frost and Murphy (field notes) recorded this heron along the Colorado River south of Moab every month of the year except January in 1962-64. Most of the records for the basin, however, are from April through July. It is likely that the majority of birds seen singly during the summer are non-breeders, but Frost and Murphy record a colony of 23 nests near Moab April 23, 1963, and a slightly smaller colony April 10, 1964. Woodbury (1958:182) found a nesting colony along the

Colorado River, 17 miles north of Lee's Ferry. Additional nesting colonies should be expected along the Green River in Wyoming and some of the larger tributaries in Colorado.

Butorides virescens (Linnaeus)

Green Heron

The only record of this species from the upper basin is that of Behle, *et al.* (1958b:39). This occurrence is based on a sight record by Clifton M. Greenhalgh, who saw one at Kanab, Utah, June 9, 1935.

Casmerodius albus egretta (Gmelin)

Common Egret

Twomey (1942:368) includes a sight record of this egret at Ashley Creek Marshes near Jensen, Uintah County, May 5, 1937. No other records for the upper basin are known to me.

Leucophoyx thula brewsteri

(Thayer and Bangs)

Snowy Egret

About 20 records, mostly from the Utah portion of the basin, are available. Twomey (1942:369) reported a nesting colony at the mouth of Ashley Creek near the Green River, Uintah County. Snowy Egrets have been recorded by several observers from San Juan County northward to northern Utah. The writer has noted them in small but consistent numbers at Pelican Lake, Uintah County, Utah, from May 12 to July 23 and a few were present there September 19, 1966. They are often seen perching on tule patches in the lake, but there is no direct evidence of nesting in that area. Several records are available for Rio Blanco, Montrose, and Grand Counties, Colorado (Warren 1908, 1909 and Felger 1910).

Nycticorax nycticorax hoactli (Gmelin)

Black-crowned Night Heron

This heron has been reported and observed in small numbers along the Colorado and Green Rivers, especially in the Utah portion, and is likely to be found throughout the upper basin. In the Intermountain West these birds seem to require marshy areas for nesting and construct their nests over several feet of water. Twomey (1942:369) found a nesting colony of ten or twelve pairs at Ashley Creek Marsh near Jen-

sen, in May 1937. The writer located a colony of about twenty pairs at Pelican Lake, June 3, 1964. All nests examined contained eggs in advanced stages of incubation, but no young were hatched. These nests were built of dead plant material and were partially hidden in dense patches of living tules. The water was three to four feet deep and the nests were built up about a foot above the water surface.

Botaurus lentiginosus (Rackett)

American Bittern

Scattered records from Sublette County, Wyoming, to San Juan County, Utah, and Grand Junction, Colorado, indicate that this species is widespread but not common. Twomey (1942:369) reports the bittern as nesting near Jensen, Uintah County, in May 1937.

Plegadis chihii (Vieillot)

White-faced Ibis

The White-faced Ibis is not known to nest in the upper basin although it is recorded as a transient in several localities. To my knowledge the only published records are those of Twomey (1942:370), who found them in spring and summer feeding in fields near Jensen; Behle (1948a:305) who noted them on the Colorado River 122 miles north of Lee's Ferry, April 14, 1947; and Bailey and Neidrach (1965:117), who have several records for Gunnison County, Colorado. The writer has found them to be rather common feeding around the borders of Pelican Lake in May and July. The likelihood of the ibis breeding in the upper basin should increase as the borders of newly created reservoirs become vegetated with emergent plants.

Ajaia ajaja (Linnaeus)

Roseate Spoonbill

Bailey and Neidrach (1965:121) report a record of seven birds seen by Don Watson on upper Colorado Reservoir, Montezuma County, Colorado, May 24, 1938.

Olar columbianus (Ord)

Whistling Swan

This swan appears to be an uncommon transient in the upper basin. Behle has recorded it from Kanab in the spring of 1945 (1958:39) and from the Colorado River near Moab in February 1952 (1960:22).

Branta canadensis canadensis (Linnaeus)
Canada Goose

About 22 records of the Canada Goose for the months of March through September are available for all parts of the upper basin. The birds nest along the banks of the larger streams, and pairs with young are often seen along the Green and Colorado Rivers in early July. They are also known to nest at Stewart's Lake Refuge near Jensen. I have observed them at Pelican Lake throughout the summer, but there is no evidence that they nest there. On September 30, 1962, a flock estimated at 50 birds left this lake about one-half hour before sunset presumably to feed on nearby grainfields and returned to the lake at sunrise the following morning.

Anser albifrons frontalis Baird
White-fronted Goose

Bailey and Neidrach (1965:44) report a record of this goose for Brown's Park, Moffat County, Colorado, October 8, 1961.

Chen hyperborea hyperborea (Pallas)
Snow Goose

Records of the Snow Goose in the upper basin are rare. Floyd A. Thompson told me that he saw a flock at Stewart's Lake south of Jensen on October 28, 1957; and Rockwell (1908:158) reports them from Grand Junction in March and October. The writer saw one immature individual feeding along the shore of Fontenelle Reservoir near Names Hill, Lincoln County, Wyoming, May 15, 1965.

Chen caerulescens (Linnaeus)
Blue Goose

This species is included in the upper basin list on the basis of a sight record from Stewart Lake south of Jensen, Utah, October 28, 1957, reported to me by Floyd A. Thompson of the Fish and Wildlife Service.

Anas platyrhynchos platyrhynchos
Mallard

About 32 records for the Mallard are available from published accounts and the writer's notes. They have been recorded from all parts of the upper basin. At any season of the year pairs or small flocks are likely to be seen in quiet estuaries near the lower Green and Colorado Rivers and their tributaries. Frost and Murphy (personal notes) observed them every month

of the year except January along the Colorado River south of Moab. On May 15, 1965, I found them to be the most common duck near Daniel, Sublette County, Wyoming, at which time most of them were seen in pairs.

Anas strepera Linnaeus
Gadwall

Although less common than the Mallard, the Gadwall is equally well distributed throughout the upper basin. Behle (1960a:22) has reported them from Kane County, Utah; and the writer found them to be fairly common on May 15, 1965, along the Green River in Lincoln County, Wyoming. Nearly all of the records are from early spring through the summer with a few reported as late as October. They were fairly common at Pelican Lake, Uintah County, Utah, September 19, 1966. Wintering records as well as nesting data are lacking in information available to the writer.

Anas acuta Linnaeus
Pintail

The Pintail is another common and widespread duck throughout the upper basin. Most of the 24 records for the basin are from February through October, although Behle (1960a:22) reports them from near Moab in December. Twomey (1942:372) noted broods of young in the Uinta Basin in July. They are abundant on several reservoirs in the Uinta Basin throughout the summer; I found them in abundance on Fontenelle Reservoir, Lincoln County, Wyoming, May 15, 1965.

Anas carolinensis Gmelin
Green-winged Teal

Available records indicate that this teal occurs regularly throughout the upper basin. Twomey (1942:373) reports young in July at Ashley Creek Marshes near Jensen. Most of the records are for March through July, but Behle (1960a:22) found them at Moab in December 1955. Several records for Moffat and Rio Blanco Counties, Colorado, have been reported by Hendee (1929), Frary (1953), and Bailey and Neidrach (1965).

Anas discors discors Linnaeus
Blue-winged Teal

Twomey (1942:373) has a record of the Blue-winged Teal nesting in the Uinta Basin,

and it is also known to nest in southwestern Colorado (A.O.U. Checklist, 1957:77). It is also known to nest at Brown's Park and Yampa River Valley, Moffat County, Colorado (Tester, 1953; Bocker, 1953). Most of some 20 records are for spring and summer. At Pelican Lake, Uintah County, Utah, I have found them to be rather common in May and early June but I have no evidence of nesting.

Anas cyanoptera septentrionalium

Snyder and Lumsden

Cinnamon Teal

All of the records available to the writer are from the more central and southern parts of the upper basin in Utah and Colorado. They are abundant at Pelican Lake, Uintah County, Utah, in May. I did not observe any on a trip through the Wyoming part of the basin May, 1965; nor do Fuller and Bole (1930) record them from there. However, the writer has seen them frequently in the Bear Lake area west of the Green River Basin Province. Dates of occurrence are almost all from April and May although Behle (1958b:41) reports them for August in Kanab. It is doubtful if this species winters within the upper basin.

Mareca americana (Gmelin)

American Widgeon

The American Widgeon seems to be rather uncommon in the upper basin although there are a few records of its occurrence throughout the area. Twomey (1942:372) found them with young in the Uinta Basin in July, 1937. Other records are for March through May. Rockwell (1908:157) found them in spring and fall at Grand Junction. Hendee (1929) found it in Moffat County, Colorado. They were noted as common at Fontenelle Reservoir, Lincoln County, Wyoming, on May 15, 1965 (Hayward field notes). A few were seen by me at Pelican Lake May 19, 1963, in the Uinta Basin, but I have never found them to be common there.

Spatula clypeata (Linnaeus)

Shoveler

Twomey (1942:374) considered the Shoveler to be a migrant in the Uinta Basin. All records available to me are for April, May, and early June and late September. On May 13, 1961, they were the most common duck on Pelican Lake and they were fairly common there June 3, 1964.

It is likely that this species will be found nesting in several favorable areas in the upper basin.

Aix sponsa (Linnaeus)

Wood Duck

The Wood Duck is apparently very rare in the upper basin. The only recent record known to me is of a specimen taken November 4, 1960, at Roosevelt, Duchesne County, Utah, and reported by Behle (1960:396). Morrison (1888) reported seeing one in La Plata County, Colorado, years ago.

Aythya americana (Eyton)

Redhead

Scattered records indicate that this duck is widespread throughout the upper basin although its breeding status in the area is not clear from information at hand. The species is present in small numbers in the Uinta Basin in May; and I found it to be very common May 15, 1965, on Fontenelle Reservoir, Lincoln County, Wyoming.

Aythya collaris (Donovan)

Ring-necked Duck

I have found only two references to this species in the upper basin. Cooke (1909:409) published a record for April 1906 at Coventry, Montrose County, Colorado; Knight (1902:35) mentions Coues' record for Green River, Uinta County, Wyoming.

Aythya valisineria (Wilson)

Canvasback

The Canvasback appears to be an uncommon migrant in the upper basin. Behle has published several records from points along the Colorado River (1948a:305, 1960a:23) and for Kanab (1958a:42). One flock of six birds was noted on Ashley Creek Lake, Uintah County, Utah, May 14 by Twomey (1942:372). Rockwell (1908:158) has a record for February 20, 1904, at Grand Junction, Mesa County, Colorado.

Aythya marila nearctica Stejneger

Greater Scaup

This species is included in the upper basin list on the basis of some old records from San Juan County, Colorado (Drew, 1881), and La Plata County, Colorado (Morrison, 1888). It seems likely that the species occurs as a rare migrant but there seem to be no recent reports.

Aythya affinis (Eyton)

Lesser Scaup

There are a few published records of this duck in the upper basin, mostly from the Utah part of it. Twomey (1942:374) recorded it from near Jensen, Uintah County, in May; and Behle (1948a:305, 1958b:42) mentions its occurrence on the Colorado River 158 miles north of Lee's Ferry and at Kanab, Kane County, in April and May. The writer has found it consistently at Pelican Lake in May and early June. Warren (1910:79) has published a record for southwest Montrose County, Colorado.

Bucephala clangula americana

(Bonaparte)

Common Goldeneye

Records of the Common Goldeneye for the upper basin are scarce. Twomey (1942:374) considered them to be common spring and fall migrants along the Green River, Uintah County; and Behle (1948a:305) found them on the Colorado River at the junction of Kane Creek, April 16, 1947, and also at Kanab in April and May. Frost and Murphy (personal notes) noted two birds on the Colorado River south of Moab, April 12, 1963. Judging from their habits in other areas adjacent to the upper basin, a few goldeneyes may be expected to occur in winter along the open streams.

Bucephala islandica (Gmelin)

Barrow's Goldeneye

Only a few records of Barrow's Goldeneye are available to the author. Behle (1958b:42) records the species at Kanab, April 20-27, 1931. The writer saw a single male on a small reservoir near Daniel, Sublette County, Wyoming, May 14, 1965, and at the same place May 28, 1966. Morrison (1888, 1889) reported it from La Plata and Dolores Counties, Colorado.

Bucephala albcollis (Linnaeus)

Bufflehead

The Bufflehead seems to be a regular although not common migrant through the upper basin. Published records available are from Jensen, Uintah County (Twomey, 1942:375); Kanab, Kane County (Behle, 1958b:42); and Grand Junction (Copeland, 1920:310). Felger (1909) recorded it from Rio Blanco County, Colorado. The writer has found them at the Adairville townsite, Kane County, April 7, 1961, and at several localities in the Uinta Basin. Most

of the records are for April and May, but I found one at Pelican Lake as late as July 22, 1961.

Histrionicus histrionicus (Linnaeus)

Harlequin Duck

There is an old record of this species by Morrison (1888), who indicated that it bred in San Juan and La Plata Counties, Colorado. Bailey and Neidrach (1965:180) state that these records were not verified by specimens, however.

Oxyura jamaicensis (Gmelin)

Ruddy Duck

The few records of this species available to the writer are all from the Utah portion of the upper basin. Twomey (1942:375) records them from the Uinta Basin in May and September, and I have noted them at Stewart's Lake and Pelican Lake, Uintah County, May 15, 1966; July 22, 1961; June 3, 1964; and September 19, 1966. Behle (1958b:42) has also published a record for Kanab, Kane County, in April and May, 1961.

Lophodytes cucullatus (Linnaeus)

Hooded Merganser

This species is included in the upper basin list on the basis of a report by Knight (1902:31) that a specimen was collected on Green River (no exact locality given) in 1870 by a member of Hayden's survey.

Mergus merganser americanus Cassin

Common Merganser

This merganser appears to be fairly common along the principal streams of the basin. Fuller and Bole (1930:45) record it from Daniel, Sublette County, Wyoming; and there are other records from Wyoming, Colorado, and Utah (Knight, 1902:30; Warren, 1908:20; Behle, 1958b:42, 1960:23). Frost and Murphy (personal notes) have nine records for the Colorado River south of Moab from January 1 to April 10.

Mergus serrator serrator Linnaeus

Red-breasted Merganser

Judging from available records, the Red-breasted Merganser seems to be less common on the streams of the upper basin than the Common Merganser. Twomey (1942:375) has records for May and September on the Green River near Jensen, and Behle (1958:2) has recorded it in April and May near Kanab. The writer saw

it on Green River near Ouray, Uintah County, May 18, 1958.

Cathartes aura teter Friedmann
Turkey Vulture

The Turkey Vulture is a common species in the upper basin. Thirty separate records available to the writer are all from the Utah, Colorado, and New Mexico parts of the basin; but the species undoubtedly occurs in the Wyoming portion as well. From the information at hand it seems likely that the Turkey Vulture leaves the northern part of the basin at least during the coldest parts of the winter. Most of our records are from April through September, but Rockwell (1908:161) records them in Mesa County, Colorado, from February to November. Frost and Murphy (personal notes), who visited the Colorado River south of Moab every month of the year, recorded them from April 10 to August 14.

Accipiter gentilis atricapillus (Wilson)
Goshawk

While the Goshawk is more commonly found in montane forests, there are a few records of its nesting in floodplain woods along the streams at lower elevations. White, *et al.* (1965:269), found it nesting in the floodplain of the Yampa River, Colorado, July 7, 1962; and the writer noted it nesting along Strawberry River, Duchesne County, Utah, in early June, 1964. In winter this hawk may be expected to occur more commonly in wooded floodplains of lower valleys. Behle, *et al.* (1958b: 43), has published a record for Kanab, March 21, 1935; and Copeland (1920:310) found it at Clifton, Mesa County, Colorado, in November, 1919.

Accipiter striatus velox (Wilson)
Sharp-shinned Hawk

The Sharp-shinned Hawk inhabits wooded habitats along valley streams throughout the upper basin. Nests are constructed in trees usually near water, and nesting activities occur in late May and throughout June. Most of our 15 records of occurrence are for April through September, but the lack of many winter records is undoubtedly owing to inadequate field work during that season. The following Utah records in the Brigham Young University collection have not previously been published: Strawberry River at Timber Canyon, Duchesne County, June 19, 1957; Roosevelt, Duchesne County, February, 1956; Ouray, Uintah County, September 23, 1961.

Accipiter cooperii (Bonaparte)
Cooper's Hawk

Some 18 records of Cooper's Hawk indicate that it occurs rather commonly throughout the upper basin. Like the Sharp-shinned Hawk it occurs in wooded areas along valley streams or near springs. Actual nesting records are few for the upper basin, but records available from the Great Basin would indicate that Cooper's Hawk nests a little earlier than the Sharp-shinned. One nesting record from the Yampa River floodplain, Moffat County, Colorado (White, *et al.*, 1965: 269), was for July 7, 1962; but the authors do not indicate how far the nesting period had progressed at that date.

Buteo jamaicensis calurus (Cassin)
Red-tailed Hawk

This species is by far the most common soaring hawk in the upper basin, where it is a permanent resident. About 40 separate records indicate that the Red-tailed Hawk occurs throughout the entire area. This species is not confined to lowlands but extends into mountainous areas as well. Nesting, at least in the more southern part of the basin, usually begins in April. Mountain-dwelling individuals often use tall trees as nesting sites, but in the lowlands the nests are more often built high up in ledges, where they are usually quite inaccessible. In open desert country this hawk is frequently seen perched on utility poles along the highways, where it becomes an easy target for the gunner.

Buteo swainsoni Bonaparte
Swainson's Hawk

This migrant hawk is apparently a summer resident throughout the upper basin, but the available records and the writer's observations would indicate that it is more common in the northern part of the basin. Swainson's Hawk seems to be less a bird of open desert country and more common near farmlands where there is an abundance of small rodents and Orthoptera on which it prefers to feed. Nesting usually begins in late April or early May and the nests are constructed in small trees or low bushes. Twomey (1942:379) reports this hawk as rather uncommon in the Uinta Basin but produces indirect evidence that it nests there. The southernmost record of nesting is that of Rockwell (1908:162) at Grand Junction, Colorado. Fuller and Bole (1930:47) found a nest near Daniel,

Sublette County, Wyoming, containing partly grown young, July 23, 1927.

Buteo regalis (Gray)
Ferruginous Hawk

Most of the few available records of this hawk are for the more southern parts of the upper basin. It seems to be rather less common, at least as a nesting species, in the Colorado basin than it is in the Great Basin west of the Wasatch Mountains. Twomey (1942:380) regards it as a migrant only in the Uinta Basin. The writer found the Ferruginous Hawk nesting at Arches National Monument, May 9, 1950. The nest was located on a crumbling rock pinnacle about 20 feet up and could not be reached. The bird sat very close, being flushed at about 30 feet. She circled close to the nest and returned as soon as we moved away. Additional sight records of the species for the upper basin not previously published are as follows: south of Cannonville, Kane County, Utah, June 16, 1960; Dewey, Grand County, Utah, July 6, 1960; Bluff, San Juan County, Utah, May, 1951 and July 8, 1960.

Buteo lagopus s. johannis (Gmelin)
Rough-legged Hawk

The only records of this hawk in the upper basin known to the writer are those of Long (1937:41), who observed one west of Bryce Canyon National Park, November 23, 1935, and Bailey and Niedrach (1965:212), who report an observation near Gunnison, Colorado, by Dr. A. S. Hyde for January 10 and November 15, 20, 1953. It is known only as a winter visitant and is probably more common at that season than the few observations would indicate.

Aquila chrysaetos canadensis (Linnaeus)
Golden Eagle

The Golden Eagle is a fairly common resident throughout the upper basin, where it is to be found in both lowland and mountainous areas. Nesting often begins in early March. Nesting within the basin has been recorded by Twomey (1942:380-381) for Blue Mountain on the Utah-Colorado border and Dripping Rock Creek, Rio Blanco County, Colorado; by Hardy (1945:581) for Book Cliffs near Sunnyside, Carbon County, Utah; by Rockwell (1908:162) for Mesa County, Colorado; and for Shiprock, San Juan County, New Mexico, by Gilman (1908:147). These birds are most often seen soaring

over probable nesting sites or feeding on carrion on the ground, often along roadways where animals have been killed by automobiles. Occasionally they are seen perching on utility poles along highways. Like all of the large predatory birds they have been heavily persecuted and their numbers have no doubt been reduced.

Haliaeetus leucocephalus (Linnaeus)
Bald Eagle

Records of this species in the basin are rather few. Rockwell (1908:262) found it years ago in several localities in Mesa County, Colorado. He regarded it as a continuous resident and stated that it was more common than the Golden Eagle in some localities. Knight reported it for the Upper Green River of Wyoming, and Behle (1958:45 and 1959:117) recorded it for two localities in Kane County, Utah. Mr. R. G. Bee, a long-time student of eagles in Utah, reports (personal notes) two nesting sites of the Bald Eagle in Wayne County, Utah. One is located in ledges at Sunglow Park near Bicknell and the other near the town of Torrey in a similar habitat. Mr. Bee saw the nests but did not actually see the birds; however, he was satisfied from the descriptions of local people who had had them under observation for several years that they were Bald Eagles. There is another unconfirmed but rather reliable report that the Bald Eagle nests near the confluence of Red Creek and Strawberry River, Duchesne County, Utah.

Circus cyaneus hudsonius (Linnaeus)
Marsh Hawk

This hawk has been frequently reported from throughout the upper basin. It is known to nest in marshy areas in the Uinta Basin (Twomey, 1942:381) and no doubt breeds in similar habitats elsewhere in the basin. The Marsh Hawk is more likely to be found around fields and pastureland or near streams where more diurnal rodents are available for food and less commonly over open deserts. However, it may be seen most anywhere in the basin especially during the non-nesting season. This species, like several other hawks, often perches on utility poles near roadways.

Pandion haliaetus carolinensis (Gmelin)
Osprey

Records of the occurrence of the Osprey in the upper basin are rare. The following pub-

lished records have been noted: Ashley Creek Marshes, Uintah County, Utah, May 15, 1935, (Twomey, 1942:382); Grand Junction, Mesa County, Colorado (Rockwell, 1908:163); Fort Bridger, Uinta County, Wyoming (Knight, 1902:78 from Drexel's report); 25 miles south of Hanksville, Wayne County, Utah, September 22, 1958 (Behle, 1960a:25); Rio Blanco County, Colorado (Felger, 1910). The writer observed one at Stuart Lake Reserve, Uintah County, Utah, May 12, 1961. The bird was perched on a post and feeding on a freshly caught fish. A day later a bird was seen in flight near Randlett, Uintah County, a few miles west of Stewart Lake.

Caracara cheriway (Jacquin)
Caracara

Matteson (1951:50) reports an injured Caracara captured alive near Glenwood Springs, Garfield County, Colorado, in the spring of 1948. The bird was eventually sent to the Denver Park Zoo.

Falco peregrinus anatum Bonaparte
Peregrine Falcon

Scattered records indicate that this falcon inhabits the upper basin rather rarely but consistently as a summer resident. Records available to me extend from May into August. Nesting has been reported by Twomey (1942:382) in cliffs east of the Green River near Jensen, Uintah County, Utah. Bailey and Niedrach (1946:253) have reported a nesting record for Durango, La Plata County, Colorado.

Falco columbarius Linnaeus
Pigeon Hawk

The status of the Pigeon Hawk in the upper basin is somewhat uncertain owing to the few records available and the seeming rarity of the species. Twomey (1942:383) regarded them as migrants along the Green River in May and September but obtained no specimens. Behle (1948a:306) published a record from the Colorado River, 136 miles north of Lee's Ferry, April 13, 1947. Rockwell (1902:74) has a winter record (December 23) from Mesa County, Colorado. According to the A.O.U. Checklist (1957:121) the species winters at Green River, Wyoming. This record may have come from Hayden's report mentioned by Knight (1902:74). Gilman (1908:147) collected and observed the bird at Shiprock, San Juan County, New Mexico, but gives no dates. I have seen the Pigeon Hawk at

Pelican Lake, Uintah County, Utah, in mid-May on two occasions.

The subspecific status of the Pigeon Hawk in the basin is not clear. It is likely that both *richardsonii* and *bendirei* may appear as migrants.

Falco sparverius sparverius Linnaeus
Sparrow Hawk

This little falcon is very common throughout the upper basin and nests throughout its entire range. About 40 available records extend through all months of the year, but most of them are from April into August. Wintering records are from the southern part of the basin in southern Utah, southern Colorado, and northwestern New Mexico. The most favored habitat of the Sparrow Hawk is the cottonwood groves along the river floodplains, where it nests in holes, usually in dead trees. Nesting in rock ledges whenever these are available is not uncommon, however. A few birds are seen in pinyon-juniper woodlands or in open desert country perched on utility poles or the tops of dead trees.

Falco mexicanus Schlegel
Prairie Falcon

The Prairie Falcon is not a common bird in the upper basin but, judging from the records available, it seems to be well distributed throughout the area. This falcon nests in very inaccessible niches on cliffs. Nesting sites can often be detected by examining the faces of the cliffs for white streaks on the rocks formed by the droppings of flying birds are noted in the vicinity. Nearly all published records as well as the writer's own notes are for sight records. Twomey (1942:382) collected a specimen from a nest containing two eggs five miles south of Jensen, Uintah County, but gives no date. Behle and Ghiselin (1958a:3) collected a specimen 15 miles south of Myton, Duchesne County, May 24, 1938. R. G. Bee (personal notes) reported a nesting Prairie Falcon at Sunglow Park, near Bicknell, Wayne County, April 15, 1959.

Bonasa umbellus incana
Aldrich and Friedmann
Ruffed Grouse

This grouse occurs in mountains surrounding the upper basin, particularly the northern part of it. The writer has been able to find only three records for the basin proper. Knight (1902:55), reporting the records of Drexel and McCarthy, recorded it from Fort Bridger,

Wyoming. Bailey and Niedrach (1965:254) report a specimen in the Denver Museum collected in Duchesne County, Utah, and another observation from the east end of the Uinta Mountains in Colorado. Elevation data are not available for either of these records. From the writer's experience with this species in southeastern Idaho, it would seem likely that these birds formerly lived in willows and cottonwood groves along streams as low as 6,000 feet.

Pedioecetes phasianellus columbianus
(Ord)

Sharp-tailed Grouse

There are very few published records of this grouse for the upper basin. Fuller and Bole (1930:50) collected it at Daniel and Pinedale, Sublette County, Wyoming; Cooke (1909:411) indicated that it was found in west and southwest Colorado; and Gilman (1907:153) found it nesting in May, 1906, at Fort Lewis, La Plata County, Colorado. Cary (1909) also reported it from Dolores and Montezuma Counties, Colorado, and from the Abajo Mountains of Utah. Bailey and Niedrach (1965:276) have summarized data furnished them by the Colorado Game and Fish Department indicating the presence of this grouse in all the western counties of that state. It is likely that the Sharp-tailed Grouse was formerly rather common on the foothills of mountains surrounding the basin, particularly the northern part of it. As a youth, I became well acquainted with this species in southeastern Idaho, where it lived in habitats identical with many places in southwestern Wyoming. The grouse lived on the sage-covered foothills at elevations of 6,000 to 7,000 feet and at the same elevation as the Sage Grouse. However, the Sharp-tailed grouse usually stayed close to thickets of taller shrubs, where it sought shelter when disturbed and during the winter. Like the Sage Grouse it often fed in grainfields or weed patches in late summer and fall.

Centrocercus urophasianus (Bonaparte)
Sage Grouse

The Sage Grouse formerly occurred throughout the upper basin wherever there were sagebrush and sufficient water. At present it is more abundant in the northern parts of the basin, particularly in Wyoming and northwestern Colorado. Bailey (1925:172-173) reports large numbers wintering around Craig and Sunbeam in the valley of Bear River, Colorado, some years ago. Several breeding grounds are known from

areas north of Rock Springs, Wyoming. The writer found several family groups in mid-July around springs in Clay Basin, Daggett County, Utah. Sage Grouse live in semidesert sagebrush country and require no other cover. However, they must live where ample water is available and seem to prefer areas where there are small springs or small streams. Frequently, especially in mid-summer and late summer, immense flocks congregate around these water sources, giving the impression that the birds are far more abundant than they actually are, considering the extensive range of sagebrush plains. One set of five eggs in the Brigham Young University collection was taken at La Barge, Lincoln County, Wyoming by Ashby D. Boyle but no date is recorded. Several sets in the same collection from Strawberry Valley, Wasatch County, Utah, were collected in late May and all showed incubation advanced to the development of skeletal elements.

Callipepla squamata (Vigors)
Scaled Quail

Only one record of this quail from the upper basin was reported by Wetherill and Phillips (1949) from Navajo, Apache County, Arizona.

Lophortyx californicus (Shaw)
California Quail

The California Quail has been introduced into the upper basin, but the extent of its range is not known to the writer. Several records are available for the Uinta Basin, Utah (Twomey, 1942:388; Hayward, field notes; Behle and Ghiselin 1958a:4); and for Grand Junction, Colorado (Cooke, 1909:411; Rockwell, 1908:160). The southern-most record available is that of Behle (1960a:26) for Castle Valley, Grand County, Utah, based on a collected specimen.

Lophortyx gambelii Gambel
Gambel's Quail

Gambel's Quail is native to deserts of the southern parts of the basin. It is known to extend as far north as Moab, Grand County, Utah (Behle, 1960a:26 and Brigham Young University collection); and Green River, Emery County, Utah (Behle, *et al.*, 1958a:47). Bailey and Niedrach (1965:287) list numerous records of this quail in the southwestern counties of Colorado. This quail is usually seen in small flocks where the cover is rather heavy and most often where water is available.

The A.O.U. Checklist (1957:143) recognizes two subspecies for the upper basin area: A darker race, *sanus* Mearns, is found "in the drainage areas of the Uncompahgre, Gunnison, and upper Rio Grande rivers"; and a lighter form is said to occur in Utah and other more westerly parts of the basin.

Phasianus colchicus Linnaeus
Ring-necked Pheasant

Records of the Ring-necked Pheasant indicate that it has been widely introduced into the Utah and Colorado parts of the upper basin. The extent of its introduction into Wyoming is unknown to the writer. These pheasants nearly all live in the vicinity of farmlands.

Alectoris graeca (Meisner)
Chukar

The Chukar has in recent years been introduced into many parts of the upper basin. It occurs in southwestern Colorado (A.O.U. Checklist, 1957:147), and we have records from Colorado River south of Moab, Utah (Frost and Murphy notes); and from Roosevelt, Duchesne County, Utah (Brigham Young University collection). Bailey and Niedrach (1965:290) indicate that the Chukar has been introduced into most of the counties of western Colorado.

Melcagris gallopavo merriami Nelson
Turkey

Some early records indicate that the Turkey may have been native to parts of Colorado, Arizona, and New Mexico within the bounds of the upper basin although they seem to occupy mountains at elevations slightly above those being considered in this paper. Gilman (1907:153, 1908:147) records them from Apache County, Arizona; Montrose County, Colorado; and the Chusca Mountains of New Mexico. His observations were based on partly plucked specimens brought to him by Indians. Behle (1960a:26) gives an account of their introduction and status in the LaSal and Abajo Mountains of San Juan County, Utah, where they now seem to be rather well established.

Grus canadensis tabida (Peters)
Sandhill Crane

Judging from the records available, the Sandhill Crane occurs mainly as an uncommon migrant through the upper basin. Rockwell (1908:159) reported the species as nesting in high mountain parks in Mesa County, Colorado.

Warren (1904:39-40) reported finding a nest with two eggs, June 5, 1903, between the slope of Ragged Mountain and Muddy Creek, western Gunnison County, Colorado, at an elevation of 8,000 feet. Twomey (1942:389) found the species migrating along the Green River in Uintah County, Utah, May 5; and Floyd A. Thompson (personal notes) reported seeing 21 birds 15 miles south of Jensen, Uintah County, October 28, 1957. There is an old collection record from Fort Bridger, Uinta County, Wyoming, by Drexel in 1858 reported by Knight (1902:43). Bailey and Niedrach (1965:299) report that these cranes migrate regularly through western Colorado.

It is likely that the race *canadensis* occurs among the migrating birds.

Rallus limicola limicola Vieillot
Virginia Rail

This widespread species undoubtedly lives throughout the upper basin in suitable marshy habitats but the only records, all of which are based on collections, are from Utah. Twomey (1942:389) reported it from Jensen, Uintah County, August 9, 1934; Woodbury and Russell (1945:45) recorded it from Bluff, San Juan County, based on a specimen collected May 14, 1892, and now in the American Museum of Natural History. Behle, *et al.* (1958b:47) found it at the Cave Lakes area near Kanab, Kane County; and Woodbury (1958:187) reported it from Moab, Grand County. A specimen in the BYU collection was taken at Myton, Duchesne County, December 27, 1959. Specimens have also been collected at Meeker, Rio Blanco County, and in Montrose County, Colorado (Bailey and Niedrach, 1965:303).

Porzana carolina (Linnaeus)
Sora

The Sora is so secretive in habits and so limited in habitat that its presence in an area is not usually reported until rather extensive field work has been done. There are no records available to me from the Wyoming portion of the upper basin although it no doubt occurs there. The following published records are herein assembled: Jensen area, Uintah County, Utah, nesting (Twomey, 1942:389); Bluff, San Juan County, Utah, May 11, 1933 (Woodbury and Russell, 1945); Yampa River, Moffat County, Colorado, nesting (Boeker 1954:105); Lay, Moffat County (Warren, 1908:20); Merkeley Park near Vernal, Uintah County, Utah, June 21,

1949, young (Behle and Gishelin, 1958a:4); Kanab area, Kane County, Utah, May (Behle *et al.* 1958b:47); Roosevelt, Duchesne County, Utah, June 1, 1950, Brigham Young University collection.

Fulica americana americana Gmelin

American Coot

The coot is undoubtedly present throughout the upper basin although, strangely enough, it is not often mentioned in the earlier literature for Colorado. The species will undoubtedly increase as new reservoirs are stabilized with some emergent shallow water vegetation suitable for nesting cover. The dates of observation of some 19 records range from March 17 to September 29. The writer found the species abundant at Pelican Lake, Uintah County, Utah, June 2, 1964. Many nests were noted in open to dense growths of *Scirpus* at that time. Some of the nests were loosely constructed of a few fresh *Scirpus* stems while others were more elaborate structures lined with dry stems. The nests contained from one to eight eggs and all the eggs seemed to be fresh.

Charadrius semipalmatus Bonaparte

Semipalmated Plover

The Semipalmated Plover is a spring and fall migrant in the upper basin where it is likely to be seen along the shores of the larger streams and shallow lakes. Twomey (1942:390) reported it from Uintah County, Utah, at Ouray and several localities along the Green River. The BYU collection contains two specimens taken at Pelican Lake, Uintah County, September 23, 1961, and September 29, 1962. There are also records for Grand and Gunnison Counties, Colorado (Bailey and Niedrach, 1965:311).

Charadrius alexandrinus nivosus (Cassin)

Snowy Plover

Records for this plover in the upper basin are rare. Behle *et al.* (1958:48) reports seeing it near Kanab, Kane County, Utah, March 28, 1931, and the writer saw a small flock at Pelican Lake, Uintah County, Utah, May 18, 1963. There appears to be no record of its nesting within the basin.

Charadrius vociferus vociferus Linnaeus

Killdeer

About 30 separate records of this common plover indicate its widespread occurrence in the

upper basin. Since it is equally at home at streamside, wet pastureland, or around borders of small ponds as well as larger reservoirs, there is an abundance of suitable habitats. The records indicate its presence from mid-March to late October, but it is likely that some birds remain throughout the winter wherever ponds or small streams may remain open.

Eupoda montana (Townsend)

Mountain Plover

The only records of the Mountain Plover in the basin are for 1858, 1859 reported by Knight (1902:53). These reports were based on Drexel's record for Fort Bridger, Uinta County, Wyoming, who stated that they were "not rare" in that area, and on specimens collected by McCarthy on Sweetwater River, Wyoming.

Pluvialis dominica dominica (Müller)

American Golden Plover

Published records of this plover for the upper basin include that of Twomey (1942:390) who saw several flocks in early May near Jensen, Uintah County, Utah, and regarded them as rather common spring migrants. Cooke (1909:410) reports a collection record for New Castle, Garfield County, Colorado, but gives no date. Hayward (1966:305) reported a single bird collected at Pelican Lake, Uintah County, Utah, September 23, 1961.

Squatarola squatarola (Linnaeus)

Black-bellied Plover

This large plover has rarely been reported for the upper basin although the writer (Hayward, 1966:305) has found it consistently at Pelican Lake, Uintah County, Utah, both in spring and fall. Four specimens from that locality in the Brigham Young University collection were taken on May 13, 1961; May 18, 1963; June 2, 1964; and September 23, 1961. On the May 13 date a flock of about thirty birds was seen around the borders of the lake, but usually they have been noted alone or in pairs often feeding some distance from the edge of the water.

Bartramia longicauda (Bechstein)

Upland Plover

The only records I have found for the upper basin are old accounts of Rockwell (1908:160) who saw the Upland Plover in Upper Plateau,

Mesa County, Colorado, and Cary (1909) who collected specimens at Loy and Meeker, Routt County, Colorado, in August 1905. Peters (Checklist, 1934:260) includes northeastern Utah in the range, which record may have come from Ridgway (U.S. Geol. Expl. 40th Par., 4, Pt. 3, 1877:611) who found it common at Kamas, Summit County, Utah. However, Kamas is not within the Upper Colorado River Basin. The present status of the Upland Plover is uncertain. There are no reports available for the Wyoming portion of the upper basin.

Numenius americanus Beckstein
Long-billed Curlew

There are rather few records of the Long-billed Curlew for the upper basin and nearly all of them available to the writer are sight records. Rockwell (1908:160) collected it at Plateau Valley, Mesa County, Colorado, in spring. Bailey and Niedrach (1965:329-30) refer to records from Gunnison, La Plata, and Rio Blanco Counties of that state. Behle *et al.* (1958b:48) observed it near Kanab, Kane County, Utah, April 7, 1935. Twomey (1942:391) and Hayward (field notes) have seven records for the Uinta Basin. All of these are for May, June, and July. I also have one sight record for Daniel, Sublette County, Wyoming, May 15, 1965. Since the curlew requires mesic fields and pasturelands as a habitat its numbers would be expected to be rather low in country predominantly desert. It might be expected that the largest breeding populations would occur in the northern Greenriver Province where more of the favorable habitats occur.

Numenius phaeopus hudsonicus Latham
Whimbrel

Only a single record (Hayward, 1966:305) is known to the writer from the upper basin. A flock of about 28 Whimbrels was seen resting on a sandbar at Montez Creek Reservoir, Uintah County, Utah, on May 18, 1963. One specimen was collected from the flock.

Limosa fedoa (Linnaeus)
Marbled Godwit

The Marbled Godwit is an uncommon migrant in the upper basin. Twomey (1942:394) published both collection and sight records for Uintah County, Utah, May 6, 1937. The writer saw a small flock in flight over Pelican Lake in

the same county, June 2, 1964. Behle *et al.* (1958b:50) reported collecting it at Kanab, Kane County, Utah, April 15, 1947. Rockwell (1908:159) also reported it from Plateau Valley, Mesa County, Colorado.

Tringa flavipes (Gmelin)
Lesser Yellowlegs

A few records of migrating Lesser Yellowlegs are available for the upper basin. Twomey (1942:372) noted it at Ashley Creek, Uintah County, Utah, in May and in September. Brigham Young University has specimens collected near the same locality, July 20, 1937; September 23, 1961; and September 19, 1966. Behle *et al.* (1958b:159) collected specimens near Kanab, Kane County, Utah, April 15, 1947, and Brigham Young University has a specimen collected in the same county at the old site of Adairville, May 20, 1961.

Tringa melanoleuca (Gmelin)
Greater Yellowlegs

The Greater Yellowlegs has a similar status in the upper basin to that of *flavipes*. The following published records are known to the writer: Plateau Valley, Mesa County, Colorado (Rockwell, 1908:159); Routt County, Colorado (Felger, 1910); Jensen, Uintah County, Utah (Twomey, 1942:392); Fort Bridger, Wyoming (Knight, 1902:49); Kanab, Kane County, Utah (Behle *et al.* 1958b:49); and Elk Ridge, San Juan County, Utah (Woodbury, 1958:188). One was seen by me at Pelican Lake, Uintah County, Utah, May 15, 1966.

Tringa solitaria cinnamomea (Brewster)
Solitary Sandpiper

This shorebird occurs regularly in the upper basin. Twomey (1942:392) found it all summer in the Uinta Basin and Brigham Young University has a specimen collected near Jensen, Uintah County, July 22, 1937. The species has also been reported by Woodbury and Russell (1945:48) for Monument Valley, San Juan County, Utah, June 22, 1893, and by Hendee (1929:24) from Moffat County, Colorado, April 27, 1924. Other records for Colorado include those of Rockwell (1908) for Mesa County, and Warren (1928) for Gunnison County. Twomey (*op. cit.*) states that it may nest in the Uinta Basin, but the nesting has not, to my knowledge, been verified.

Actitis macularia (Linnaeus)
Spotted Sandpiper

Over thirty records available to the writer indicate that the Spotted Sandpiper is common along waterways and around ponds and lakes throughout the upper basin. This species occurs from at least the first of May through September. There are nesting records for Lily, Routt County, Colorado (Warren, 1908:20), and for the Uinta Basin (Twomey, 1942:391). Its continuous presence from late spring through the summer indicates that it is a regular breeding species.

Catoptrophorus semipalmatus inornatus
(Brewster)
Willet

The Willet has been considered to be a migrant only throughout the southern part of the basin. Twomey (1942:392) found it in the Uinta Basin in spring and fall, but not during midsummer. My own records are all for May and early June. The writer noted mating demonstrations at Montez Reservoir, Uintah County, Utah, on May 18, 1963, but no actual nests have been discovered. I would rather expect it to nest in the Upper Green River Province where there are more damp and grassy meadows suitable for nesting sites. Bailey and Niedrach (1965:342) list records for La Plata and Gunnison Counties, Colorado, published in 1888 and 1899. There seem to be no recent records for western Colorado.

Limnodromus scolopaceus (Say)
Long-billed Dowitcher

All records available to me for this species are from the Utah portion of the upper basin. Twomey (1942:383) collected specimens in May in the Uinta Basin and Behle *et al.* (1958b:49) found it near Kanab, Kane County, Utah, May 1, 1946. The writer has collections from Pelican Lake, Uintah County, Utah, May 12-13, 1961; July 22, 1961; and September 23, 1961. The May specimens are all in full breeding plumage. The specimens taken in late July are similar in plumage to the breeding plumage in May except that the white edges of the feathers of the underparts are narrower, giving a more uniform tawny coloration. Spots on the throat and head are more scattered. The back is much darker. The September specimen is in winter plumage.

Capella gallinago delicata (Ord)
Common Snipe

The Common Snipe is distributed along the waterways throughout the upper basin. A number of references (Behle *et al.*, 1958b:48, Rockwell, 1908:159) indicate that it remains throughout the year at least in some parts of the basin. This snipe requires a boggy pastureland for nesting sites which may limit its occurrence particularly in the southern parts of the area. Published nesting records are those of Twomey (1942:391) for the Uinta Basin and Boeker (1954:105) for the Yampa River country of northwestern Colorado. The Upper Green River Province offers more favorable nesting habitats and the birds are in fact rather common there.

Crocethia alba (Pallas)
Sanderling

Little is known about the occurrence of the Sanderling in the upper basin. It is known to be a spring and fall migrant through the Uinta Basin of Utah. Twomey (1942:394) found it near Jensen, Uintah County, May 4, 1937, and May 21, 1935. The Brigham Young University collection contains specimens taken at Pelican Lake, Uintah County, May 13, 1961; May 15, 1966; and September 23, 1961. It was one of the more common shorebirds along the shallow borders of the lake on May 15 where it occurred in pairs or small flocks.

Ereunetes mauri Cabanis
Western Sandpiper

This is a common migrant species through the upper basin where it is often seen in large flocks around the borders of ponds and lakes. It has been recorded for the months of May, July, August, and September. Fall migrants apparently reach the Uinta Basin area about mid-July. The Brigham Young University collection contains specimens collected in the Uinta Basin area as follows: May 18, 1963; May 13, 1966; July 22, 1961; and September 23, 1961.

Erolia minutilla (Vieillot)
Least Sandpiper

This small shorebird is a rather consistent migrant through the upper basin and should be looked for in winter wherever there are unfrozen ponds or lake margins. It has been recorded within the basin for the months of April, May, July, and September. The writer found

several small flocks of Least Sandpipers at Pelican Lake, Uintah County, Utah, July 22, 1961. Some of these may have been early fall migrants. One specimen was collected at this same locality September 19, 1966.

Erolia bairdii (Coues)

Baird's Sandpiper

Records of this species in the upper basin are scarce. Twomey (1942:393) found them migrating along the Green River in the Uinta Basin in May and September. Rockwell (1908:159) reported them from Grand Junction, Mesa County, Colorado. The Brigham Young University collection contains two specimens taken at Pelican Lake, Uintah County, Utah, September 23, 1961.

Erolia melanotos (Vieillot)

Pectoral Sandpiper

Only a few records are known to me from the upper basin. Rockwell (1908:159) reported it as a migrant at Grand Junction, Mesa County, Colorado. Specimens were collected in La Plata County by Morrison (1888). Fuller and Boles (1930:53) state that "one bird was found on the McDole Ranch, Daniel, Sublette County, Wyoming, September 17, 1923, in a small area of marshland." Apparently the specimen was not collected.

Erolia alpina (Linnaeus)

Dunlin

The Dunlin is known as a spring migrant in the upper basin. Twomey (1942:393) saw them at Ashley Creek Marshes, Uintah County, Utah, May 1, 1935. The writer saw several small flocks at Pelican Lake, Uintah County, Utah, May 15, 1966.

Micropalama himantopus (Bonaparte)

Stilt Sandpiper

Knight (1902:47) reporting a record by Coues refers to a specimen of Stilt Sandpiper collected at Fort Bridger, Uinta County, Wyoming, but gives no date. Bailey and Niedrach (1965:354) report specimens collected by Carter in 1884 in Grand County, Colorado.

Recurvirostra americana Gmelin

American Avocet

The avocet has been reported frequently, especially from the Utah portion of the upper

basin and as far north as Green River City, Wyoming. I have seen these birds throughout May, June, and July at Pelican Lake, Uintah County, Utah, where there is ample area suitable for nesting. I observed some mating performances on June 2, 1964, but there is still no positive evidence of nesting. Birds are occasionally seen in small groups resting or feeding along the Colorado River and its tributaries but these are no doubt transient or nonbreeding birds. Frost and Murphy (field notes) saw them along the Colorado River south of Moab, Utah, May 15, 1964, and July 20, 1962. I have noted a pair on the San Juan River near Bluff, Utah, July 8, 1960.

Himantopus mexicanus (Müller)

Black-necked Stilt

Aside from a record by Rockwell (1908:159) for Grand Junction, Colorado, all of our observations are from the Utah portion of the basin. Most of my records are for Pelican Lake, Uintah County, where it occurs rather commonly during May, June, and July. On July 22, 1961, I found it to be abundant there feeding in the shallow water. There is as yet, however, no positive record of nesting. For the most part, the Black-necked Stilt is a transient through the upper basin.

Steganopus tricolor Vieillot

Wilson's Phalarope

There are numerous records of this species indicating that it is widespread at least as a migrant throughout the upper basin. I have been unable to find records of nesting, but it would be expected to breed especially in the northern part of the Green River Province where there is more suitable habitat in the form of wet and grassy meadows. I have found Wilson's Phalarope at Pelican Lake, Uintah County, Utah, in May, June, and July, but it is most abundant there about mid-May. I also noted many flocks around Daniel, Sublette County, and along the Green River at Fontenelle Reservoir, Lincoln County, Wyoming, May 15, 1965.

Lobipes lobatus (Linnaeus)

Northern Phalarope

The Northern Phalarope is found as a migrant both in spring and fall. Like Wilson's Phalarope they prefer shallow ponds or the edges of lakes for feeding and are often seen swimming. I have observed them at Pelican Lake, Uintah County, Utah, where they often

mingling with larger flocks of Wilson's Phalarope. In the early morning of May 14, 1966, I collected several specimens from large flocks seen flying along the shores of the lake.

Larus californicus Lawrence
California Gull

A few California Gulls have been reported at various points within the upper basin. It can be expected that they will increase as new reservoirs are formed and especially if islands for nesting colonies are established. Frost and Murphy (personal notes) recorded them from the Colorado River south of Moab, Utah, March 3, 1962; April 10, 1964; and October 18, 1963. The writer has noted a few at various reservoirs in the Uinta Basin in May, and Twomey (1942:396) found a few in the same area also in May.

Larus delawarensis Ord
Ring-billed Gull

Except for one record from Grand Junction, Colorado, by Rockwell (1908:157) all of our data on this gull pertain to the Utah portion of the upper basin. It has usually been regarded as a winter visitor to this area but there are records for all of the summer months from May until late September. Twomey (1942:396) gives an account of the nesting of a few pairs along the Green River between Jensen and Green River Gorge. This nesting record was based on observations of ranchers living near the river. The Brigham Young University collection contains two specimens taken at Pelican Lake, September 23, 1962.

Larus pipixcan Wagler
Franklin's Gull

Franklin's Gull is a spring and summer visitor to the upper basin. It has been reported from the Uinta Basin, May 10, 1937 (Twomey, 1942:396); Colorado River, 148 miles north of Lee's Ferry, April 13, 1947 (Behle, 1948:306); and from Kanab, Kane County, Utah, April 15 (Behle *et al.*, 1958b:50). The Brigham Young University collection contains three specimens taken at Pelican Lake, Uintah County, Utah, July 22, 1961, and June 2, 1964, and two at the same locality May 15, 1966. The July specimens are in juvenile plumage. The June specimen has not attained full adult plumage. On May 15, 1966, a large flock from which the above specimens were taken fed on earthworms around the shores of the lake.

Larus philadelphia (Ord)
Bonaparte's Gull

The only record of this gull in the upper basin known to the writer is that of Behle *et al.* (1958b:51) for Kanab, Kane County, Utah, April 15, 1947.

Xema sabini sabini (Sabine)
Sabine's Gull

Bailey and Niedrach (1965:387) have brought together a few records of this small gull for western Colorado. It has been reported from Meeker, Rio Blanco County; Carbondale, Garfield County; and from near Blue Mountain, Moffat County. At present it is known only as a fall migrant.

Sterna forsteri Nuttall
Forster's Tern

This tern has rarely been reported from the upper basin. Twomey (1942:397) found it along the Green River in Uintah County, Utah, May 10, 1937. He saw only two birds in flight and regarded the species as rare. Behle *et al.*, (1958b:51) reported it from Kanab, Kane County, May 1, 1946. The writer has found this tern rather common at Pelican Lake, Uintah County, where it nests. One specimen was collected there May 14, 1961, and there are sight records for May 13, 1961; May 18, 1963; July 22, 1961; and June 2, 1964. On June 2 a nest was found on a floating mat of *Scirpus* near a protective growth of the same plant. It contained one fresh egg. Activities of the birds indicated that there were other nests in the same general area.

Hydroprogne caspia (Pallas)
Caspian Tern

Twomey (1942:397) reports seeing a Caspian Tern, two miles south of Jensen, Uintah County, Utah, July 19, 1937. This is the only record for the upper basin known to me.

Chlidonias niger (Linnaeus)
Black Tern

There are scattered reports of this tern from the Utah and Colorado portions of the upper basin. Twomey (1942:397) found it nesting near the Yampa River, Moffat County, Colorado. The writer has found it to be common in spring and summer at Pelican Lake, Uintah County, Utah, throughout May, June, and July. Young of the

year were collected there on July 22, 1961, but no nests have actually been discovered. On May 15, 1966, the Black Tern was abundant at the lake where it was feeding on insects skimmed from the surface of the water.

Synthliboramphus antiquum (Gmelin)

Ancient Murrelet

A single record of this species was reported by Killpack and Hayward (1958:23). A female specimen that had fallen to the ground exhausted was picked up near Roosevelt, Duchesne County, Utah, November 12, 1955. The specimen is now in the Brigham Young University collection.

Columba fasciata Say

Band-tailed Pigeon

The Band-tailed Pigeon is apparently mostly a mountain-inhabiting species (Behle, 1960:28) in the southern part of the upper basin. Cottam (1941:122) gives several records for the Blue Mountains, San Juan County, Utah, where flocks were seen at elevations near 8,000 feet in yellow pine forests. Behle and Ghiselin (1958:4) report a specimen taken near Hanna, Duchesne County, Utah, in 1930, but they had no information about the habitat. This is the most northerly record available to me. There is an old record by Cooke, reported by Rockwell (1908:161) of the occurrence of this species at Glenwood Springs, Garfield County, Colorado. The writer saw one September 17, 1966, in a pinyon-juniper habitat about 10 miles south of La Sal, San Juan County, Utah.

Zenaidura macroura marginella

(Woodhouse)

Mourning Dove

The Mourning Dove is common in summer throughout the entire basin. A few apparently winter especially in the southern part of the area. Gilman (1907:153) reports them at Navajo Springs, La Plata County, Colorado, in January, and Rockwell (1908:161) found them at Grand Junction in February. Gilman (1908:147) noted their occurrence at Shiprock, San Juan County, New Mexico, in winter. Behle *et al.* (1958b:51) gives a collection record for Kanab, Kane County, Utah, December 28, 1946. Most of some 75 separate records available to the writer are for April through September. In the upper basin Mourning Doves occur most commonly along cottonwood-lined streams where they nest in

trees or on the ground from early May through June. They are usually the most common and conspicuous birds in summer among the floodplain trees and shrubs and adjacent to these where they feed mostly on the ground. Where there are farmlands they often visit grainfields in late summer in large flocks.

Coccyzus americanus occidentalis Ridgway

Yellow-billed Cuckoo

The Yellow-billed Cuckoo is likely a sparse summer resident in the floodplain woodlands along the major streams of the basin. Actual records of its occurrence are, however, very few. A specimen in the Brigham Young University collection was obtained at Bluff, San Juan County, Utah, July 2, 1927. Rockwell (1908:164) found it nesting at Grand Junction, Mesa County, Colorado, and Felger (1910) reported it from near Meeker, Rio Blanco County, Colorado. Monson (1939:168) records it from Waterflow, New Mexico.

Geococcyx californianus (Lesson)

Roadrunner

The AOU Checklist (1957:270) states that the Roadrunner occurs in southern Utah and Colorado. The only specific records known to me are those of Behle *et al.* (1958b:51) who saw specimens near Kanab, Kane County, Utah, April 2, 1947; May 1, 1946; May 20, 1947; and November 29, 1947. Bailey and Niedrach (1965:407) mention a record for Durango, Colorado, November 10, 1961. This record was taken from the Audubon Field Notes.

Tyto alba pratincola (Bonaparte)

Barn Owl

Twomey (1942:398) reports the occurrence of this owl in several parts of Uintah County, Utah. Gilman (1907:154) records sight records from Mancos, Montezuma County, and Fort Lewis, La Plata County, Colorado. Behle *et al.* (1958b:52) has collection records for Kanab, Kane County, Utah, June 14, 1939; July 10 and 12, 1940; and May 2, 1946. He also reports (1941a:160) that it nests in caverns in that area.

Otus asio (Linnaeus)

Screech Owl

The Screech Owl occupies thickets and cottonwood groves along the major streams of the upper basin. While the writer has no evidence of its occurrence in the Green River Basin Pro-

vince, it will undoubtedly be found there. Collection records are known for the vicinity of Moab, Grand County, Utah (Miller and Miller, 1951:169; Behle, 1941b:182; Brigham Young University collection, June 9, 1927) and from near Jensen, Uintah County, Utah (Twomey, 1942:398, and a sight record by Hayward, May 18, 1958).

The subspecific status of the Screech Owls of the upper basin is somewhat in doubt. Specimens from the vicinity of Moab have been variously identified as *myoensis* (specimen in BYU collection named by H. C. Oberholser and J. W. Aldrich), *mychophilus* (Behle, 1941:182) and *cineraceus* (Miller and Miller, 1951:169). Miller and Miller (*op. cit.*) were not able to recognize the race *mychophilus* proposed by Oberholser (1937:255). According to Miller's map, the race *cineraceus* occurs in the upper basin as far north as central Utah and Colorado while *myoensis* occupies the northern part of the basin. They did not, however, appear to have examined any specimens from the latter area. Behle (1941:71) doubts that *cineraceus* occurs at all in the Utah population and would place them all in the race *myoensis* with some intergradation toward *cineraceus* southward.

Otus flammeolus flammeolus (Kaup)
Flammulated Owl

This owl usually inhabits forested mountainous areas within its range and it is so rarely encountered that its status within the upper basin is in doubt. Woodbury and Russell (1945:55) collected it at Navajo Mountain, San Juan County, Utah, and recorded it from pinyon-juniper forest in that area. Gilman (1907:154) reported a sight record for Ft. Lewis, La Plata County, Colorado. Bailey and Niedrach (1965:417) refer to specimens in the Denver Museum from Durango, La Plata County.

Bubo virginianus (Gmelin)
Great Horned Owl

The Great Horned Owl is a common resident in all seasons throughout the upper basin. It occurs in wooded areas along the streams as well as in pinyon-juniper forests. They likewise inhabit canyons in more desert areas where there are suitable rocky ledges on which they nest. About 25 sight and collection records from various parts of the basin representing all months of the year except December and January are known to me from published accounts and my field notes.

Two subspecies appear to be resident within the basin. The race *pallascens* is found in the south and *occidentalis* occurs in the north, but the exact limits of their ranges are unknown. The race *lagophonus* is a rare winter visitor in the area (Behle and Ghiselin, 1958:5).

Nyctea scandiaca (Linnaeus)
Snowy Owl

The only record of this owl from the upper basin known to me is that of Felger (1910) who observed it in Rio Blanco County, Colorado.

Glaucidium gnoma californicum Selater
Pygmy Owl

This uncommon owl is usually considered to be a bird of montane coniferous forests, but there is evidence that it occurs rather consistently in deciduous wooded areas along valley streams at lower elevations. Gilman (1907:154) found them nesting at Ft. Lewis, La Plata County, Colorado. The writer collected two specimens including a young bird of the year, and saw another one in Cottonwood Canyon, 22 miles south of Cannonville, Kane County, Utah (el. about 5,000 ft.) June 18, 1960. Another specimen in the Brigham Young University collection was taken near Roosevelt, Duchesne County, Utah (el. 5,000 ft.) June 22, 1957. The species should be expected along any of the floodplain deciduous woodlands throughout the basin.

Speotyto cunicularia hypugaea (Bonaparte)
Burrowing Owl

The Burrowing Owl lives in the open plains throughout the upper basin. Individuals are frequently seen in prairie dog colonies where they inhabit some of the abandoned holes of these animals. Specific published records are not available for the Green River Province, but the general range described in the AOU Checklist (1957) would indicate that they occur there. Unpublished records from the Brigham Young University collection are as follows: nesting near Willow Tank Spring, Kane County, Utah, May 2, 1962; collected at Roosevelt, Duchesne County, Utah, September 19, 1953; seen at Pelican Lake, Uintah County, Utah, May 18, 1963.

Strix nebulosa nebulosa Forster
Great Gray Owl

The Great Gray Owl is included in this list on the basis of a single record by Knight (1902:

8) for Wells, Uinta County, Wyoming. A specimen was collected "near the great bend of the Green River" but no date of collection was indicated.

Strix occidentalis lucida (Nelson)

Spotted Owl

This owl has been reported from several localities, especially in the southern part of the basin. Woodbury and Russell (1945:58) collected an immature male at the base of Navajo Mountain, San Juan County, Utah, August 3, 1936. Published sight records are as follows: Ft. Lewis, La Plata County, Colorado (Gilman, 1907:154); Escalante Canyon, Garfield County, Utah, August, 1957, and Glen Canyon, Kane County, Utah (Behle, 1960:29). The most northerly record is that of Killpack (personal notes) who watched one for some time on the East Tavaputs Plateau, Uintah County, Utah. This bird apparently inhabits dense pinyon-juniper woodland or other tall shrubby vegetation within its range in the upper basin.

Asio otus (Linnaeus)

Long-eared Owl

Numerous records indicate that the Long-eared Owl is rather common in suitable habitats everywhere within the upper basin. They inhabit dense growths of woodlands along the streams and are also frequently found in pinyon-juniper and oak thickets where they often occupy the abandoned nests of magpies. My records for the upper basin are all for spring and summer but these owls are known to be permanent residents in other areas.

In earlier works the upper basin population has been referred to the race *wilsonianus* (Behle, 1944:75 and 1958:52) but lately the western form has been called *tuftsi* (AOU Checklist, 1957:287; Behle, 1960b:29).

Asio flammeus flammeus (Pontoppidan)

Short-eared Owl

Judging from the few reports of this owl from the upper basin, it is an uncommon resident probably owing to the scarcity of suitable habitat. Available records, however, indicate that it is widespread where there are damp pasturelands suitable for its nesting and feeding. The following occurrences are reported in the literature: near Jensen, Uintah County, Utah (Twomey, 1942:401); 12 mi n. Daniel, Sublette County, Wyoming (Fuller and Bole, 1930:54);

Sweetwater River, Wyoming (Knight, 1902:81); Plateau Valley, Mesa County, Colorado (Rockwell, 1908:163); La Plata County, Colorado (Morrison 1888); Moffat County, Colorado (Felger, 1910, and Hendee, 1929).

Aegolius acadicus acadicus (Gmelin)

Saw-whet Owl

The Saw-whet Owl is usually considered to be a bird of montane coniferous forests but individuals are known to descend to thickets and wooded areas along lower valley streams in winter. Woodbury (1939:158) reported a specimen taken in willow thickets near Moab, Grand County, Utah, November 15, 1936. Two specimens in the Brigham Young University collections were taken in similar habitats at Vernal, Uintah County, Utah, December 29, 1957, and at Neola, Duchesne County, February 4, 1959.

Phalaenoptilus nuttallii nuttallii (Audubon)

Poor-will

The Poor-will is a common summer resident in desert shrub and pinyon-juniper communities throughout the upper basin. The calling of these birds is possibly the most characteristic sound in evening and early morning. About 20 separate records from the literature and the writer's notes range from April 27 to September 19.

Chordeiles minor (Forster)

Common Nighthawk

Some 35 records of the Common Nighthawk available to me indicate its widespread occurrence everywhere within the upper basin. For nesting sites these birds prefer low and rather barren ridges where the eggs are laid on bare ground and where adults, eggs, and young are completely exposed. Nesting data from records at Brigham Young University are as follows: Ute Mountain, Montezuma County, Colorado, June 23, 1927, nest containing two eggs; Jensen, Uintah County, Utah, July 23, 1937, nest containing two young birds unable to fly; Bridgeport, Daggett County, Utah, July 8, 1954, nest containing two eggs. During the nesting season nighthawks tend to concentrate at dusk and dawn around lakes or over ponds where food is more abundant. The writer witnessed such concentrations at Pelican Lake, Uintah County, Utah (June 2, July 6, July 22), when there was an abundance of midges on which the birds were feeding.



Fig. 14. Nest and eggs of the Common Nighthawk (*Chordeiles minor*) Bridgeport, Daggett County, Utah, July 8, 1954. Photo by C. L. Hayward.



Fig. 15. Young of Common Nighthawk (*Chordeiles minor*) near Vernal, Uintah County, Utah, July 23, 1937. Photo by C. L. Hayward.

Subspecific identification of the upper basin population of nighthawks presents some difficult problems. For the interested reader, these matters are discussed by Selander (1954) and Hayward (1940). It seems that the races *hesperis*, *howelli* and *henryi* can all be identified, but there are large areas in the Uinta Basin and northwestern Colorado where there is such variation in the population that assignment of every specimen to a subspecies seems quite impractical. In general, however, the western race *hesperis* occurs in the western part of the Uinta Mts. and Green River Basin Provinces; *howelli* is found in the eastern portions of these provinces, and *henryi* belongs principally to the Colorado Plateau Province.

Cypseloides niger (Gmelin)
Black Swift

The only records of this swift known to the writer are from southwestern Colorado. Nesting records for areas in Grand County were reported

by Bradbury (1918:103), and more recent records by Knorr (1950, 1961) have been published. Indications are that these swifts usually occupy higher elevations than those considered in this report.

Aëronautes saxatalis saxatalis (Woodhouse)
White-throated Swift

Numerous records attest to the fact that this swift is a common bird in the Uinta Mts. and Colorado Plateau Provinces of the upper basin. On the basis of its general distribution, it is presumed that it occurs also in the Green River Basin Province. Records of occurrence range from May 1 to September 6. The abundance of deep canyons and cliffs in much of the basin affords ample nesting sites and many records of nesting have been reported. Numerous observations of birds entering and leaving crevices are on record but such sites are usually impossible to reach and care needs to be taken to determine that the birds are actually nesting and not merely exploring.

Twomey (1942:403) regarded the swifts of the Uinta Basin as belonging to the subspecies *schateri* principally on the basis of their larger size. However, the presence of this race within the basin appears to be somewhat in doubt.

Archilochus alexandri
(Bourcier and Mulsant)
Black-chinned Hummingbird

The Black-chinned Hummingbird is one of the more common hummers particularly in the Uinta Mts. and Colorado Plateau Provinces. I have no data on its status in the Green River Basin. It is a bird of desert areas where it is most commonly seen in floodplain woodlands or pinyon-juniper forests. Specimens in the Brigham Young University collection are as follows: Jensen, Uintah County, Utah, July 19, 1937; Calf Creek, Garfield County, Utah, July 4, 1938; Strawberry River at Dark Canyon, Duchesne County, Utah, June 19, 1958; Randlette, Duchesne County, Utah, July 1, 1957; Fruita, Wayne County, Utah, June 8, 1960.

Selasphorus platycercus platycercus
(Swainson)
Broad-tailed Hummingbird

This species is the most common hummingbird in the upper basin where it is a summer resident in mountain as well as along the lowland streams. At lower elevations it is more common as a migrant but the writer found it nesting near the junction of White and Green Rivers, Duchesne County, Utah (elevation about 6,500 ft.), June 22, 1954. The nesting site was in a small crevice of a cliff about 15 feet up. The female was seen to feed young. About 20 records available to the writer indicate that the species is widespread throughout the area although it is more commonly encountered near streams or other bodies of water.

Selasphorus rufus (Gmelin)
Rufous Hummingbird

As far as the writer knows, the Rufous Hummingbird occurs in the upper basin only as a migrant although it may nest in the northern part of it. It is known to breed in western Montana (A.O.U. Checklist, 1957:303). All of the records available to me are for late summer and early autumn. I found them to be abundant along the roadways in the Uinta Basin, July 22, 1961, at which time they were feeding from the blossoms of roadside plants. The Brigham Young

University collection contains 2 specimens taken at Henrieville, Garfield County, Utah, September 9, 1937, and two collected at Randlette, Uintah County, Utah, July 22, 1961. During migration this species may be found at all elevations in the mountains as well as in the lowlands.

Stellula calliope (Gould)
Calliope Hummingbird

The only available records of this hummer for the upper basin are a sight record in the Glen Canyon area, July 9, 1958, reported by Behle (1960a:31), and records from Mesa Verde Park and Gunnison County, Colorado (Bailey and Niedrach, 1965:475). This species breeds primarily at higher elevations in mountains but might be expected as a transient along streams in the lowlands.

Megaceryle alcyon (Linnaeus)
Belted Kingfisher

The Belted Kingfisher is a consistent, although uncommon summer resident along waterways in all parts of the upper basin. Being restricted to the vicinity of streams suitable for fishing, and clay or sandy banks where nesting sites are available, the species is spotty in its distribution. Twomey (1942:406) has published several records from the Uinta Basin of eastern Utah and western Colorado. There are also a number of other records for western Colorado (Warren, 1908:21; Gilman, 1907:154; Rockwell, 1908:164) and for southern Utah (Behle *et al.*, 1958b:54 and 1960a:31). Dates of collections and observations range from April 21 to September 20.

Colaptes auratus luteus Bangs
Yellow-shafted Flicker

The yellow-shafted form of the flicker has been reported a few times from the upper basin although it is nowhere as common as the red-shafted form. Gilman (1908:148) reported a specimen from Shiprock, New Mexico, and Wetherill and Phillips (1949:102) collected it at Cameron, Coconino County, Arizona. There is a male specimen in the Brigham Young University collection from near Roosevelt, Duchesne County, Utah, taken January 7, 1959.

Intermediate forms between Yellow-shafted and Red-shafted Flickers have usually been considered to be hybrids between *C. auratus* and *C. cafer* although some authors (Blair *et al.*, 1957:513) consider them as well as the yellow-

shafted and red-shafted forms to belong to a single species *auratus*. Whatever may be the correct interpretation, intergrading characters are often seen in the flicker population of the upper basin. Behle and Selander (1952:28) noted this in specimens from the Uinta Basin. Several specimens from that area in the Brigham Young University collection show indications of the red nuchal collar but otherwise appear to be typical *cafer*.

Colaptes cafer collaris Vigors
Red-shafted Flicker

The Red-shafted Flicker is a common resident in the upper basin throughout the year. It is the most common woodpecker encountered in wooded areas along streams where it nests most frequently in holes in cottonwood trees. About 70 collections and sight records are available to the writer including records for every month of the year and every section of the upper basin where suitable habitat is available.

Dryocopus pileatus picinus (Bangs)
Pileated Woodpecker

This species is known to occur rarely in the upper basin as far north as the Uinta Basin. Behle and Ghiselin (1958:6) report 3 specimens seen in yellow pine 30 miles north of Roosevelt, Duchesne County, Utah, August 10, 1943. The writer saw one at Cottonwood Wash west of Blanding, San Juan County, Utah, September 6, 1956.

Melanerpes erythrocephalus caurinus
Brodkorb
Red-headed Woodpecker

This predominantly midwestern form of the Red-headed Woodpecker occurs sparingly in at least some parts of the upper basin. Warren (1908:21) reported seeing specimens near Steamboat Springs, Routt County, Colorado. Twomey (1942:407) found one dead near Ouray, Uintah County, Utah, July 28, and Killpack and Hayward (1958:23) have published collection and sight records from about the same locality, July 27, 1937, and May 29, 1955. Indications are that these birds inhabit floodplain cottonwood groves and probably nest there.

Sphyrapicus varius nuchalis Baird
Yellow-bellied Sapsucker

While the Yellow-bellied Sapsucker is usually considered to be primarily a mountain-

dwelling bird in the Intermountain West, it is actually rather common as a breeding species along the lowland river floodplains. About twenty records are available from as far south as Bluff, San Juan County, Utah (Woodbury and Russell, 1945:67), to Pinedale, Wyoming (author's field notes). While there is likely some migration of more northerly populations the species is known to winter at least as far north as Duchesne County, Utah.

Sphyrapicus thyroideus nataliae
(Malherbe)

Williamson's Sapsucker

It seems likely that this species occurs only rarely as an altitudinal migrant at lower elevations in the basin. Woodbury and Russell (1945:67) note a specimen collected at Riverview, San Juan County, Utah, April 27, 1927. Rockwell (1908:164) records it from Grand Junction, Mesa County, Colorado. Other records available are from higher elevations beyond the scope of this paper.

Asyndesmus lewis (Gray)
Lewis' Woodpecker

There are sufficient records to indicate that this species is rather widespread throughout the upper basin where it breeds in wooded areas along the streams. Its occurrence, however, seems to be somewhat spotty and unpredictable. On the wide Green River floodplain near Ouray, Uintah County, Utah, I found it to be the most common woodpecker. Numerous pairs were nesting May 17, 1958, in large cottonwoods dead but still standing. Especially in late summer or early autumn Lewis' Woodpecker is often seen in loose flocks perched on utility poles along roadways or in dead trees in agricultural areas.

Dendrocopos villosus (Linnaeus)
Hairy Woodpecker

The Hairy Woodpecker is another species that is usually considered to be primarily a mountain dweller, but numerous references indicate that it is not uncommon at lower elevations along the river floodplains as well as in more dry situations. The writer found a pair nesting in a dead pinyon pine 20 miles south of Moab, San Juan County, Utah, June 12, 1964, and there are many other records of occurrence at lower elevations during the nesting season. Migrants from higher elevations seemingly in-

crease the population along the floodplain woodlands in winter.

Two subspecies of *D. villosus* occur in the upper basin. The smaller *D. v. leucothorectis* (Oberholser) occupies the southern portion of the basin, probably within the Colorado Plateau Province and the isolated mountains therein. Wing measurements of two males from San Juan County, Utah, were 121 and 124 mm. and of two females from San Juan County and Wayne County, Utah, were 124 and 119 mm. Wing measurements of two males from the Uinta Basin were 137 and 139 mm. and of two females from the same area were 130 and 137 mm. These latter specimens clearly belong to the larger race *D. v. monticola* (Anthony) which presumably occupies the Uinta Mountains and Green River Provinces and their surrounding mountains.

Dendrocopos pubescens leucurus (Hartlaub)
Downy Woodpecker

The Downy Woodpecker has been recorded somewhat less frequently than the Hairy Woodpecker from the lower elevations of the basin, presumably because it is more often a winter resident in wooded areas along the lowland streams and less of a summer resident there. However, there is evidence from information available that the Downy Woodpecker does nest in cottonwood groves. The writer saw signs of nesting activities on the Green River floodplain near Ouray, Uinta County, Utah, May 17, 1958, and specimens were collected there June 17, 1958. Gilman (1908:147) found them nesting at Shiprock, New Mexico. Most of the lowland records, however, are for winter, early spring, and late summer and fall. Twomey (1942:409) indicates that they leave the lowlands of the Uinta Basin in summer to nest in higher mountains.

Tyrannus tyrannus (Linnaeus)
Eastern Kingbird

Most of the available records of the Eastern Kingbird are for the Uinta Mountains Province and northward although Behle *et al.* (1958b: 56) collected specimens in breeding condition near Kanab, Kane County, Utah, June 18, 1947. In our field work in the Colorado Plateau Province we have never encountered them, although Woodbury *et al.* (1949:20) indicates that they have been reported from Wayne County, Utah. There is also a record by Gilman (1907:154) who found them at Navajo Springs,

La Plata County, Colorado, in June. Warren (1908) noted them in Routt and Moffat Counties, Colorado.

Tyrannus verticalis Say
Western Kingbird

This common and conspicuous kingbird is found in suitable habitats throughout the Colorado Plateau and Uinta Mountains Provinces. We have only one record of it for the Green River Basin Province at Fort Bridger, Wyoming. It prefers woodlands along the streams, especially where there are large cottonwoods for nesting and perching. However, it also frequents farming country where there are large trees or utility poles. The species seems to prefer high perches but may also be seen on fence posts or tall shrubs.

Tyrannus vociferans vociferans Swainson
Cassin's Kingbird

All of our records for Cassin's Kingbird are from the Colorado Plateau Province although its occurrence in Montana and Wyoming (A.O.U. Checklist, 1947:334) indicates that it may yet be found in the northern provinces of the basin. This species lives under similar habitat conditions as does the Western Kingbird, being partial to cottonwood groves along the lowland streams. The two species are often found near human dwellings.

Myiarchus cinerascens cinerascens
(Lawrence)
Ash-throated Flycatcher

This comparatively large flycatcher is one of the more common summer residents among the flycatchers of the upper basin. Our records are all from the Uinta Mountains and Colorado Plateau Provinces, but it is also known to occur in southwestern Wyoming (A.O.U. Checklist, 1957:339). The species lives in a wide variety of habitats. It is frequently seen in deciduous woodlands along the lowland streams but seems to be equally at home in pinyon-juniper woodlands some distance from water. Gilman (1908: 145) reported that at Shiprock, New Mexico, this flycatcher was found nesting in woodpecker holes.

Sayornis nigricans semiatra (Vigors)
Black Phoebe

The only published records of the Black Phoebe in the upper basin known to me are those summarized by Cottam (1927:77) and

Behle *et al.* (1958b:57) who mentioned sight records in the vicinity of Kanab, Kane County, Utah. The writer saw one at Bluff, San Juan County, Utah, September 13, 1966.

Sayornis saya saya (Bonaparte)

Say's Phoebe

Say's Phoebe is a common summer and occasional winter resident in all parts of the basin. It is a bird of more open desert situations, characterized by shrubby vegetation rather than either deciduous or evergreen woodlands although it occurs also in the latter habitats as well. Nests are most frequently built on low ledges of rock or near the entrance to caves or else in outbuildings or old, abandoned houses. These flycatchers often live around ranches and agricultural communities.

Empidonax traillii (Audubon)

Traill's Flycatcher

This small flycatcher seems to be rather uncommon in the upper basin, but appears to be well distributed throughout the entire area. All of our records are for the Colorado Plateau and Uinta Mountains Provinces but there is no reason why it should not occur northward. Traill's Flycatcher is an inhabitant of willow thickets and other medium shrubs and is, therefore, rather limited to such habitats. In habits it is somewhat more secretive than most flycatchers, a fact which may account in part for its seeming scarcity. Furthermore, there is comparatively little of the preferred habitat present in the upper basin.

Owing to a considerable amount of variation within the species, the separation of the group into subspecies, in spite of the efforts of several ornithologists, seems to be somewhat confused especially with respect to the upper basin population. The A.O.U. Checklist (1957:43-344) recognizes only two subspecies (*brewsteri* Oberholser and *traillii* (Audubon)) in North America but other names have been proposed and used in reference to the upper basin. The name *brewsteri* Oberholser was applied to the forms from the Monument Valley area by Voodbury and Russell (1945:74). Twomey (1942:412) referred to the Uinta Basin birds as *dastus* Oberholser, and Behle (1958b:7, 1958b:8, 1960b:33) used the same name for specimens from Duchesne, Duchesne County, Utah; Kanab, Kane County, Utah; and for several places along the Green and Colorado Rivers. The name *extimus* Phillips has also been applied

to some specimens from southern Utah. The present state of knowledge on the migration and residence of this species in the upper basin makes it impossible to arrive at any clear understanding of the status of the several races within the basin at this time.

Empidonax hammondii (Xanthus)

Hammond's Flycatcher

This flycatcher breeds at higher elevations, preferably in coniferous forests and may be expected in the upper basin only as a migrant. However, Gilman (1907:155) reported it as nesting at Ft. Lewis, La Plata County, Colorado. This, however, was only a sight record. Collection records of the species in the basin are not common. Brigham Young University has specimens collected at Arches National Monument, Grand County, Utah, May 11, 1949; and from near Colton, Utah County, June 6, 1957. The latter would be at a nesting elevation. Twomey (1942:412) collected it near Jensen, Uintah County, Utah, August 9, 1937, and Behle *et al.* (1958b:58) obtained specimens near Kanab, Kane County, Utah, May, 1946-47. There is also an old record from Fort Bridger, Uinta County, Wyoming (Knight, 1902:103) but no date of occurrence is given.

Empidonax oberholseri Phillips

Dusky Flycatcher

The Dusky Flycatcher, which has often been confused with *wrightii* Baird and has also been called *griseus* Brewster, is of uncertain status in the upper basin. Behle *et al.* (1958b:53 and 1960a:33) have published the only records from the Utah portion of the basin. They collected it near Kanab, Kane County, Emery and Green River, Emery County, and Dewey, Grand County, all in Utah. All of their collections were made in May and August, and they considered the species to be a migrant only. Bailey and Niedrach (1965:528) cite a number of records from western Colorado counties.

Empidonax wrightii Baird

Gray Flycatcher

The Gray Flycatcher is by far the most common summer resident of any of the small flycatchers. It lives mostly in pinyon-juniper forests but may also be seen in deciduous woodlands along the streams. All of the numerous records are for the Colorado Plateau and Uinta Mountain Provinces, but it also likely occurs in the

Green River Basin Province of Wyoming (A.O.U. Checklist, 1957:346). The dates of collection available to the writer are from April 21 through August 26.

Empidonax difficilis hellmayri Brodkorb
Western Flycatcher

From the evidence at hand it appears that this uncommon flycatcher is a rare migrant in the upper basin. It does breed, however, at lower elevations in the montane forest but seems to require situations close to water. There are no records for midsummer but Behle *et al.* (1958b:53, 1960a:58) have records for May and August for southern Utah and northern Arizona. Twomey (1942:414) reported them from the Uinta Basin in late May.

There is a likelihood that the race *difficilis* Baird may occur in the northern part of the basin (Behle, 1948b:72).

Contopus sordidulus Sclater
Western Wood Pewee

The Western Wood Pewee is the most common of the small flycatchers inhabiting floodplain deciduous woodlands where it breeds. It has been collected and reported frequently from favorable habitats throughout the basin. Most of the dates of occurrence are for June and July, with one record as late as September 8, and one for late May.

Nuttallornis borealis (Swainson)
Olive-sided Flycatcher

This species, which breeds in mountains bordering and within the upper basin, migrates along waterways at lower elevations. Twomey (1942:414) considered it to be a rather common migrant along the basin streams of the Uinta Basin in late May and early June. Gilman (1908:148) reported it as a migrant at Shiprock, New Mexico, at about the same time of year. The writer collected one from a dead cottonwood at the old townsite of Paria, Kane County, Utah, May 20, 1961.

Pyrocephalus rubinus flammeus
van Rossem
Vermilion Flycatcher

The only records known to me of this species in the upper basin are those of Hyde (1953:216) for Gunnison County, Colorado, November 18, 1952, and Behle *et al.* (1958b:59) for Kanab,

Kane County, Utah, June 18, 1947. Both are collection records.

Eremophila alpestris (Linnaeus)
Horned Lark

The Horned Lark is an abundant species in suitable habitat throughout the upper basin. They are usually seen in flocks in open desert country especially in areas of sparse shrubby vegetation where the soil is rather rocky or in old fields or along roadways where the native vegetation has been disturbed. In winter they congregate in large flocks on low ridges where the snow has been blown off to expose food. There are ample records to indicate that this species occurs in the area throughout the year. Nesting begins in early April. The writer has found young of the year able to fly by May 19. While Horned Larks live under extreme desert conditions, the availability of water within a reasonable distance seems to be an important factor in their distribution. The creation of reservoirs, both large and small, within the basin will no doubt influence the distribution and population of the species. At Pelican Lake I have seen them in flocks hovering over shallow water and apparently feeding on insects from the surface. In early evening during the summer the birds tend to concentrate around the margin of these water sources in large flocks. At such times they seem practically fearless of man in their anxiety to obtain the necessary water.

Three subspecies of Horned Larks may be found in the population of the upper basin. The race *leucolaema* Coues occurs in the Green River Basin Province and also in the Uinta Mountains Province (Peters: Checklist, Vol. 9, 1960:76). The subspecies *occidentalis* (McCall) occurs in the lowlands of the Colorado Plateau Province but Behle (1960b:34) states that the specimens examined by him intergrade toward *leucolaema* as well as toward *utahensis*. The latter subspecies is typical of the eastern Great Basin but seemingly appears in the Colorado basin west of the Green and Colorado Rivers at least as a winter visitor.

Tachycineta bicolor (Vieillot)
Tree Swallow

The Tree Swallow appears rather frequently in spring and early summer, often in flocks with other species, along streams and over reservoirs where there is an abundance of flying insects. The writer's experience is that they are never as abundant as the Violet-green Swallow. The

species is known to nest in the mountains and has rarely been found nesting in trees along the lowland streams. All of the records available to me are for May and early June. Nothing has been recorded relative to their fall migration.

Tachycineta thalassina lepida Mearns

Violet-green Swallow

This species is probably the most common swallow seen feeding in sizeable flocks over streams and reservoirs. They frequent places where there is border vegetation with an accompanying and large supply of midges and other insects. The earliest date of occurrence available to me is for April 20, 1962, when Frost and Murphy (field notes) found them feeding along the Colorado River near Moab, Grand County, Utah. They are common through May, June, and July and until mid-August. Although they are commonly seen in the lowlands throughout the summer, the Violet-green Swallow is principally a mountain-nesting species. Twomey (1942:415) believes that the birds seen feeding in the lowlands in summer have come there from their nesting places in the mountains. This writer would not be surprised, however, if they are eventually found nesting in trees along lowland floodplains or in crevices in rocky ledges. Some evidence of this was indicated when the writer saw them entering and leaving holes in cottonwood trees along the Colorado River at Dewey, Grand County, Utah, July 7, 1960. Near Rainbow, Uintah County, Utah, many miles from any large amount of water, Violet-green Swallows were commonly feeding over pinyon-juniper woodland and low desert shrubs. They were seen entering and leaving crevices in sandstone ledges in early June, 1954, as if preparing to nest. I have also noted this same type of activity at Daniel, Sublette County, Wyoming, May 28, 1966.

Progne subis subis (Linnaeus)

Purple Martin

In the Intermountain West, the Purple Martin is principally a bird of the mountains where it nests in small numbers. In the lowlands it appears usually as a migrant with flocks of swallows. Twomey (1942:417) reported it as nesting in boxes at the town of Vernal, Uintah County, Utah. He also noted it in other localities in the Uinta Basin during the nesting season. Rockwell (1908:174) reported it at Grand Junction, Mesa County, Colorado, but regarded the occurrence as accidental. Morrison (1886:153)

found them nesting at Ft. Lewis, La Plata County, Colorado.

Stelgidopteryx ruficollis serripennis
(Audubon)

Rough-winged Swallow

The Rough-winged Swallow occurs apparently throughout the upper basin. Records available to the writer indicate that it is present from early May to late August. It is sometimes found with flocks of bank swallows but may be encountered in flocks of its own species. The writer found the species in large flocks feeding over small ponds near Duchesne, Duchesne County, Utah, May 12, 1961; and at Adairville, Kane County, Utah, May 20, 1961. Specimens were collected from those flocks. There seems to be no published records of nesting in the upper basin although nesting would surely be expected.

Twomey (1942:416) refers birds from the Uinta Basin to the race *aphractus* Oberholser, but this subspecies is not now recognized, and *serripennis* (Audubon) is considered to be the widespread subspecies in North America (Peters: Checklist, 1960:92).

Riparia riparia riparia (Linnaeus)

Bank Swallow

The Bank Swallow is most conspicuous in the upper basin as a migrant in late August where it is frequently seen perched in large flocks on utility wires along the roadsides. There are, however, scattered references to nesting in the basin. Twomey (1942:416) found nesting colonies in the Uinta Basin area in mid-June, 1937, and also as late as August 5, 1937. The writer found a small colony nesting along the Strawberry River, Duchesne County, Utah, June 2, 1964.

Hirundo rustica erythrogaster Boddaert

Barn Swallow

This species is frequently seen in large feeding flocks throughout the upper basin, especially in May. Nesting takes place in June when the birds tend to pair off and nest as single pairs or small flocks in barns and other outbuildings near settlements. There seem to be no recent reports of the Barn Swallow nesting in natural situations within the basin, but Ernest Ingersoll described large colonies nesting in niches in rocks near Hot Sulphur Springs, Grand County, Colorado, in 1874 (Bent, 1942:442). Records of occur-

rences available to the writer range from April 22 to August 31.

Petrochelidon pyrrhonota pyrrhonota
(Vieillot)
Cliff Swallow

The abundance of suitable habitat for the Cliff Swallow in the upper basin accounts for the numerous records for all parts of the upper basin. Records of occurrence range from May 1 through August. They frequently nest under bridges or under the eaves of barns or other buildings, but large colonies also build nests on the face of the abundant cliffs that occur along the Colorado River and its tributaries.

Owing to the fact that this species shows considerable variability in size and coloration there has been considerable confusion in the subspecies names applied to the upper basin population. This matter was discussed by Behle (1948b:73). It would now appear, however, that the upper basin contains but the single race *pyrrhonota* (Vieillot) unless it be that the subspecies *tachina* Oberholser may be found in Arizona and New Mexico (Peters' Checklist, 1960:120-121).

Gymnorhinus cyanocephala Wied
Pinyon Jay

This is the most common species of Corvidae particularly in the Uinta Mountain and Colorado Plateau Provinces. It is abundant throughout the pinyon-juniper forests of the area and in the woodlands along the streams. The extent of its occurrence in the Green River Basin Province is not known although it is common along the northern slopes of the Uinta Mountains. Numerous records indicate that the Pinyon Jay is a permanent resident throughout its range. Nesting occurs in April and May, and families remain together during the summer. The species is nearly always seen in flocks, which tend to wander from place to place continuously.

Cyanocitta stelleri macrolopha Baird
Steller's Jay

Steller's Jay is primarily a bird of montane coniferous forests and mountain bushland but it occasionally extends downward into the mouths of canyons along wood-bordered mountain streams even in summer. In winter the species sometimes lives at lower elevations where there are streams bordered by cottonwoods. It seems likely that this wintering habit is more prevalent

in the northern portion of the basin. Gilman (1907:155) found them to be numerous in winter at Fort Lewis, La Plata County, Colorado. A specimen in the Brigham Young University collection was taken at Whiterocks, Uintah County, Utah, February 2, 1954.

Aphelocoma coerulescens (Bosc)
Scrub Jay

This jay is rather common at all seasons of the year in the Uinta Mountains and Colorado Plateau Provinces. It is found also in the southern part of the Green River Basin Province along the north base of the Uinta Mountains but apparently does not extend much farther northward. The species is found in habitats where there is pinyon-juniper or else tall deciduous shrubs. It is often seen in wooded areas along the streams. It does not form large flocks like the Pinyon Jay but is more often seen singly or in pairs. Sometimes, however, it is found with flocks of Pinyon Jays.

Pitelka (1951:282) states that within the upper basin area there is considerable intergradation between the Rocky Mountains race *woodhouseii* (Baird) and the Great Basin race *nevadae* Pitelka. However, he considers the population to be more closely related to *woodhouseii* in the main. Behle (1948b:74) regarded specimens from Kanab, Kane County, Utah, as being closer to *nevadae*.

Pica pica hudsonia (Sabine)
Black-billed Magpie

This species occurs throughout the upper basin. In the Green River Basin Province it is particularly abundant where it builds its conspicuous nests in willow thickets and cottonwoods along the streams. It often lives in the vicinity of ranches and small settlements. Southward the magpie becomes progressively less common in the upper basin. It has sometimes been said to occur only as far south as central Utah (Peters: Checklist, 1962:254) but there is ample evidence that it ranges to the southern part of that state. Woodbury and Russell (1948:88) reported it from Bluff, San Juan County, Utah, and there is a specimen in the Brigham Young University collection from the same area. Gilman (1908:148) found it common at Shiprock, New Mexico, and also (1907:155) at Ft. Lewis, La Plata County, Colorado. I found it to be very common in the Four Corners area on a trip there in early September, 1966.

Nucifraga columbiana (Wilson)

Clark's Nutcracker

Clark's Nutcracker is a bird of montane coniferous forests where it is most common from timberline down to the yellow pine zone. It occasionally visits lower altitudes and may even nest in pinyon-juniper. Records of its occurrence within the limits of this report are rare. Gilman (1907:155) found it at Ft. Lewis, La Plata County, Colorado, March 11, 1906, and saw it with its young in May indicating that it may have nested there. Rockwell (1908:168) reported it from Plateau Valley, Mesa County, Colorado, and considered it to be a resident there. The writer noted several families in yellow pine at La Sal, San Juan County, Utah, July 8, 1960; and also saw a few individuals in pinyon-juniper some miles south of La Sal in early September, 1966.

Corvus brachyrhynchos hesperis Ridgway

Common Crow

The Common Crow occurs in all parts of the basin, particularly along streams or around ranches and farms. In the southern provinces it is rare in summer, but may become fairly common in winter. Twomey (1942:420) found it nesting near Jensen, Uintah County, Utah, and it is likely that a few may nest all along the Colorado River and its tributaries. Bergtold (1942:158) reported it from Durango, Colorado, but considered this to be an unusual southern record. In the Green River Basin Province, the Common Crow occurs regularly at least in summer where it nests in trees and willow thickets along the streams of that area.

Corvus sinuatus Wagler

Raven

This species is a common resident in the upper basin throughout the year. Many records are available from all parts of the basin but the Raven appears to be especially common in the canyonlands of the Colorado Plateau Province. In that area it is frequently seen or heard calling from cliffs bordering the streams. It undoubtedly nests in these areas.

Parus atricapillus garrinus Behle

Black-capped Chickadee

The Black-capped Chickadee is a fairly common and permanent resident in cottonwood groves and willow thickets along streams

throughout the upper basin. They build their nests under loose bark or in holes in the trees. These birds are usually seen as scattered pairs at all seasons or in family groups following the nesting.

Parus gambeli Ridgway

Mountain Chickadee

The Mountain Chickadee occurs more commonly in mountains at elevations beyond this report but is, nevertheless, sometimes seen in floodplain woodlands at lower elevations. Gilman (1907:195) found it nesting at Ft. Lewis, La Plata County, Colorado, but it seems to occur usually as a winter or early spring visitor. The writer found it to be rather common in cottonwood groves along White River near Bonanza, Uintah County, Utah, in late September, 1966.

According to Behle (1956) two races of Mountain Chickadees may be expected in the upper basin. The subspecies *gambeli* Ridgway occurs in the eastern part of the area while a race called *wasatchensis* Behle (1950) is said to occupy the western part of it.

Parus inornatus ridgwayi Richmond

Plain Titmouse

This species is a common resident throughout much of the upper basin. It is particularly abundant in pinyon-juniper forests but is by no means confined to this habitat. The Plain Titmouse is most abundant in the southern provinces of the basin, but it occurs also in the Green River Basin at least as far north as Greenriver, Wyoming (A.O.U. Checklist, 1957:393).

Psaltirparus minimus plumbeus (Baird)

Common Bushtit

The range of this species in the upper basin is similar to that of the Plain Titmouse. It is more likely, however, to be encountered in low brush and in small flocks. Its northward range in the basin is uncertain but it probably extends as far as Greenriver, Wyoming (A.O.U. Checklist, 1957:396).

Sitta carolinensis nelsoni Mearns

White-breasted Nuthatch

Most of the records of this species are from elevations in the mountains higher than those considered in this report. However, there are ample records to indicate its presence in pinyon-juniper and in deciduous woods along the streams within the basin. The Brigham Young

University collection contains specimens from Blanding, San Juan County, Utah, June 25, 1927; Green River floodplain at Ouray, Uintah County, Utah, May 17, 1958; and Whiteriver south of Bonanza, September 19, 1966. At the latter places they were common in cottonwood groves and in May there were indications that they were preparing to nest. I have also seen this species in pinyon-juniper south of La Sal, Utah, in early September. Gilman (1907:195) found them nesting at Ft. Lewis, La Plata County, Colorado and there are numerous other published records from the Colorado Plateau and Uinta Mountains Provinces. Their status in the Green River Basin Province is unknown to me.

Sitta canadensis Linnaeus
Red-breasted Nuthatch

The Red-breasted Nuthatch is principally an inhabitant of montane coniferous forests where it may be found the year around. There are a few records of occurrence, however, along the river floodplains at lower elevations. The writer found them present but uncommon in cottonwoods near Ouray, Uintah County, Utah, May 17, 1958. Twomey (1942:424) noted one near this same place, September 30. Gilman (1908:141) reported seeing one near the river at Shiprock, New Mexico. These records could be indications of some altitudinal migration in the species. Bailey and Niedrach (1965:581) state that in Colorado there is some irregular migration of this nuthatch down to the prairie stream-sides in fall and winter.

Sitta pygmaea melanotis van Rossem
Pigmy Nuthatch

The Pigmy Nuthatch is primarily a bird of yellow pine forests within the upper basin. In such forests it is very common especially in the Colorado Plateau Province. There are a few records from lower elevations, however. Gilman (1908:151) found them numerous in pinyon-juniper near Shiprock, New Mexico, and reported (1907:195) that they nested in a similar habitat at Ft. Lewis, La Plata County, Colorado.

Certhia familiaris Linnaeus
Brown Creeper

The Brown Creeper breeds in mountain forests but seems to be a rather regular winter visitor in deciduous woods along lowland streams. Behle (1960a:39) found them at Green

River, Utah, May 7, 1933, and at Hite, Garfield County, Utah, October 21, 1958. He also reported them from Kanab, Kane County, Utah, December 30, 1946. Gilman (1907:195) noted them in January at Ft. Lewis, La Plata County, Colorado.

Most individuals of the upper basin population appear to be of the race *montana* Ridgway, but Behle (1948b:75) referred specimens from Kanab, Utah, to *leucosticta* van Rossem, a race inhabiting southern Nevada.

Cinclus mexicanus unicolor Bonaparte
Dipper

While the Dipper is usually thought of as an inhabitant of cold mountain streams it is sometimes found along rocky streams at lower elevations. The Brigham Young University collection contains specimens from Escalante, Garfield County, Utah, June 9, 1936, at an elevation of 5,300 feet; and near Fruita, Wayne County, Utah, June 8, 1960, at 5,400 feet. It has also been reported by Benson (1935:443) from Rainbow Bridge, San Juan County, Utah, (elevation 3,800 feet).

Salpinctes obsoletus obsoletus (Say)
Rock Wren

Abundant records indicate the common occurrence of the Rock Wren throughout the upper basin. They are to be found wherever there are rocky outcroppings of any extent from remote desert areas to the vicinity of streams. About 43 records available to the writer range from March 7 through September. It is likely that some of them may winter in the southern part of the basin, but no positive wintering records are available.

Salpinctes mexicanus conspersus (Ridgway)
Canyon Wren

This wren inhabits the deeper canyons or areas of extensive cliffs wherever such habitats are found within the upper basin. Dates of occurrence available to this writer range from March 3 through October, but it is said to winter also throughout its breeding range (A.O.U. Checklist, 1957:421).

Cistothorus palustris (Wilson)
Long-billed Marsh Wren

There are few records available for this species in the upper basin owing perhaps to the

lack of extensive areas of suitable marshland habitats. Behle has published several records including Moab, Grand County, Utah (1941b:183); Kanab, Kane County, Utah (1948b:76, 1958:67); Escalante River, Garfield County, Utah (1960a:40). Twomey (1942:426) found it near Jensen, Uintah County, Utah; and Rockwell (1908:178) reported Cooke's record from Routt County, Colorado. Bailey and Niedrach have summarized records for La Plata, Garfield, Mesa, and Moffat Counties, Colorado. The Brigham Young University collection contains two specimens from near Kanab, taken April 8, 1961.

The race *plesius* Oberholser seems to occupy most of the upper basin, but Behle (1948:75-76) considered some of the Kanab specimens to be *aestuarinus* (Swarth). The latter race appears to extend an unknown distance up the Colorado River from its more typical range in southern California and Arizona.

Thryomanes bewickii eremophilus
(Oberholser)
Bewick's Wren

Bewick's Wren seems to be generally distributed throughout the upper basin. It inhabits dryer situations where there are pinyon-juniper forests but is also found in taller deciduous shrubbery. It is considered to be a resident throughout its range (Peters: Checklist, 1960:396).

Troglodytes troglodytes (Linnaeus)
Winter Wren

Inclusion of this species is based on a record from the Fremont River, Capitol Reef Monument, Utah, November 5, 1941, reported by Behle *et al.* (1958b:67). There is also a record for Gunnison County, Colorado (Selater, 1912).

Troglodytes aedon parkmanii Audubon
House Wren

In the upper basin the House Wren lives in cottonwood groves along the stream floodplains where it is fairly common. Dates of occurrences range from May 17 through September 7 in the records available to the writer.

Dumetella carolinensis (Linnaeus)
Catbird

The Catbird is a fairly common summer bird in the upper basin. They inhabit thickets along

the streams and seem to be entirely restricted to this habitat. Gilman (1908:151) recorded the species at Shiprock, New Mexico, as early as May 7, but the spring arrival is somewhat later in more northern latitudes. Most of the records are for late May and early June. Information on the later summer and autumn activities is lacking.

Mimus polyglottos leucopterus (Vigors)
Mockingbird

The Mockingbird is rather common in the Colorado Plateau and Uinta Mountains Provinces of the upper basin. It has not, to the writer's knowledge, been reported from the Green River Basin, but it may yet be found there. The species becomes progressively less common northward, but it does occur consistently in the Uinta Basin area. Records range from as early as April 26 at Henrieville, Garfield County, Utah, to September 9 at Escalante, Garfield County (author's notes). Frost and Murphy (field notes) found it along the Colorado River south of Moab, Utah, from May 15 through August 14. The Mockingbird lives in rather tall, shrubby growth, or small trees in open desert, or near streams. It is especially common in greasewood communities which often border broad washes or occur in low valleys.

Oreoscoptes montanus (Townsend)
Sage Thrasher

Information at hand indicates that this species is well distributed throughout the upper basin. It inhabits the sagebrush community but is by no means confined to this habitat. It seems to be equally at home in any type of desert shrub as well as in undergrowth along streams. Dates of occurrence range from April 28 to September 9 in the records available to the author.

Toxostoma rufum longicauda (Baird)
Brown Thrasher

There are only a few records of this species in the upper basin. Brigham Young University has a specimen collected at Roosevelt, Duchesne County, Utah, December 29, 1955; and the writer saw one at the junction of the San Rafael and Green Rivers, Emery County, Utah, June 4, 1957. Hyde (1953:216) records a sight record from Sapinaro, Gunnison County, Colorado, and Gilman (1907:195) reported the

species as nesting at Ft. Lewis, La Plata County, Colorado.

Toxostoma bendirci bendirci (Coues)

Bendire Thrasher

The Bendire Thrasher occurs only in the southern part of the basin. The Brigham Young University collection contains a specimen from Monument Valley, Utah, July 4, 1927; and the writer has a sight record from Wahweap Creek, Kane County, Utah, May 20, 1956. Behle (1958b:68) reports a specimen collected at Escalante, Garfield County, Utah, May 9, 1937, and a sight record in the Glen Canyon area, July 14, 1958 (Behle, 1960a:4). The species seems to be nowhere common within the basin.

Sialia mexicana Swainson

Western Bluebird

The Western Bluebird ranges throughout the upper basin where it is reported to breed in the mountains and winter in the lowlands. The writer found a number of pairs nesting in aspens near Kanab, Kane County, Utah, May 7, 1957, and saw a large flock at a much lower elevation also near Kanab, December 27, 1957. The northernmost record for the basin is that of Fuller and Bole (1930) from Pinedale, Sublette County, Wyoming. The species seems to be scattered rather unevenly over the upper basin and its habitat relationships are not clear.

There are apparently two subspecies of Western Bluebirds represented in the upper basin (Peters: Checklist, 1964:184). The race *occidentalis* Townsend may be expected in the Green River Basin Province and possibly the Uinta Mountains Province, while *bairdi* Ridgway occurs in the Colorado Plateau Province.

Sialia currucoides (Bechstein)

Mountain Bluebird

Numerous records indicate the widespread distribution of this species in the upper basin. It is a resident throughout the year particularly in the southern part of the area. It formerly probably nested rather regularly in woods along the stream floodplains and in buildings and bird houses, but its nesting is now confined mostly to the mountains where disturbance from starlings and house sparrows is less in evidence. At the present time Mountain Bluebirds are usually seen along roadways in late summer perched in long rows on utility wires or in flocks in winter. On December 27, 1957, the writer noted a large

flock feeding on fruit of the Russian olive that was growing wild along a small stream near the old townsite of Adairville, Kane County, Utah.

Myadestes townsendi townsendi (Audubon)

Townsend's Solitaire

Townsend's Solitaire seems to be a rather frequent visitor in late fall, winter, and early spring to lower elevations in the upper basin. In nesting it appears to be confined to surrounding mountains. Rockwell (1908:179) found it in winter in Mesa County, Colorado, and Behle *et al.* (1960a:42) recorded it from Moab in December. The Brigham Young University collection contains specimens taken at Arches National Monument, Utah, May 9, 1949; Bridgeland, Duchesne County, Utah, March 11, 1956; and 3 miles south of Bonanza, Uintah County, Utah, September 21, 1966.

Catharus ustulatus almae (Oberholser)

Swainson's Thrush

This thrush, also sometimes known as the Olive-backed Thrush, is a breeding bird of the mountains where it resides in the summer. Its occasional occurrence at lower elevations as a transient is indicated by a record of Twomey (1942:531) who collected it near Jensen, Uintah County, Utah, May 29, 1935. Behle (1960a:42) found it near Green River, Emery County, Utah, May 24, 1947. Since the breeding range is often at lower elevations in the montane forest, this thrush should be looked for along the floodplains of the streams especially in the northern part of the basin.

The subspecies *swainsoni* (Tschundi) has been listed in the past as the race living in the upper basin area. Bond (1963:373-387) has recently shown that *almae* (Oberholser) is the race occupying the intermountain area while *swainsoni* occurs farther east. Behle (1948b:76) also arrived at this same conclusion.

Catharus guttatus (Pallas)

Hermit Thrush

The Hermit Thrush is a mountain breeding species that occurs occasionally as a transient at lower elevations in the basin. Twomey (1942:429) states that it migrates regularly along the wooded banks of the Green River, Uinta Basin, in May and September. The writer collected one at Arches National Monument, Utah, May 9, 1949, and another at Whiteriver, 3 miles south of Bonanza, Utah, September 21, 1966.

Several subspecific names have been applied to material from the upper basin, but it now appears that the most likely races are *polionotus* (Grinnell) or *auduboni* (Baird), either of which might be expected in the migrating population.

Catharus fuscescens (Stephens)

Veery

This species, also sometimes called the Willow Thrush, is included on the basis of a record by Knight (1902:157) for Fort Bridger, Uinta County, Wyoming. This was originally reported by Drexel in 1858. The species should be looked for in streamside thickets especially in the Green River Basin.

Turdus migratorius propinquus Ridgway

Robin

The Robin is a common resident of the entire upper basin throughout the year. It winters more commonly in the southern part of the basin. It inhabits floodplain woods along all of the streams and is also common around settlements and farms.

Poliophtila caerulea amoenissima Grinnell

Blue-gray Gnatcatcher

This species is a common summer resident in the Uinta Mountains Province and the Colorado Plateau Province. The gnatcatcher is especially common in pinyon-juniper but may also be found in desert shrubs and streamside thickets. Dates of occurrence range from late April to mid-September, but it is possible that some may winter in the southern part of the basin.

Regulus calendula cineraceus Grinnell

Ruby-crowned Kinglet

This small species is most likely to be seen in the upper basin principally as a spring and fall migrant. Dates of records at hand range from April 8 to October 25, but there are no records for late June, July, or August. According to Twomey (1942:433) fall migration begins in the Uinta Basin in early September. The writer found them common near Kanab, Kane County, Utah, on April 8, 1961, but these may have been wintering birds since they are said to winter in southern Utah (A.O.U. Checklist, 1957:454). When migrating or wintering, Ruby-crowned Kinglets are most often seen in deciduous woods along the streams where they occur

in small flocks. Nesting apparently is confined to montane forests at higher elevations.

Regulus satrapa olivaceus Baird

Golden-crowned Kinglet

This kinglet is a mountain-dwelling species that has some altitudinal migration. Behle *et al.* (1958a:71) found it in February in pinyon-juniper forests near Grover, Wayne County, Utah. The species seems to be nowhere common, and the writer could find no other records for the upper basin.

Anthus spinoletta (Linnaeus)

Water Pipit

The Water Pipit is a fairly common wintering species at least in the Uinta Mountains and Colorado Plateau Provinces. They occur in flocks especially near bodies of water that may remain open through part or all of the winter. All of the records available are for September through April. The species nests at high elevations in mountains surrounding the basin or farther north.

It is possible that representatives of three races of pipits may be found in the wintering and transient population. A series of specimens taken in late September and winter in the Uinta Basin are clearly in the subspecies *alticola* Todd which is the nesting species of the Colorado and Utah mountains. Peters' Checklist (1960a:160) indicates that *rubescens* (Tunstall) migrates to southern Utah, and there is probability that *pacificus* Todd may be found at least in the southern part of the basin (Behle *et al.*, 1958b:72).

Lanius ludovicianus gambeli Ridgway

Loggerhead Shrike

This shrike inhabits open desert shrub areas as well as streamside thickets throughout the upper basin. It is known to winter in southern Utah (Behle *et al.*, 1958b:73; Hayward, field notes) but how far north it remains all winter has not been recorded. The most northern winter record is a specimen collected in Duchesne County, Utah, December 28, 1960. Most observers have considered this species to be uncommon in the upper basin and the writer has found it to be less common there than in the Great Basin to the west.

The upper basin population has been referred to the races *excubitorides* Swainson and

gambeli Ridgway by Twomey (1942:435) and to *nevadensis* Miller by Behle (1960a:43). The latter race has not been recognized either in the A.O.U. Checklist (1957) or in Peters' Checklist (1960). According to the last-named checklist, the population of the upper basin would fall within the range of *gambeli* (1960:353).

Lanius excubitor invictus Grinnell
Northern Shrike

The Northern Shrike is an uncommon winter visitor to the upper basin. The following records are available to the writer: Brigham Young University collection; Myton, Duchesne County, Utah, November 18, 1950; Fort Bridger, Wyoming, one specimen collected in 1858 and recorded by Knight (1902:42); Mesa County, Colorado, recorded as "sparse in winter" by Rockwell (1908:175); near Johnson, Coconino County, Arizona, November 27, 1937, reported by Behle *et al.* (1958b:73).

Bombycilla garrulus pallidiceps Reichenow
Bohemian Waxwing

The Bohemian Waxwing has been rarely reported from the upper basin, but this is probably due to lack of reporting rather than scarcity of occurrence. In the Great Basin, this bird is an unpredictable but often common winter visitor especially around settlements where there are ornamental shrubs or fruit trees bearing dried fruit. The writer suspects that it is no less common in the upper basin. Collection or observation has been recorded from Fort Bridger, Wyoming (Knight 1902:141); Grand Junction, Mesa County, Colorado (Rockwell, 1908:175); and Kanab, Kane County, Utah (Behle *et al.*, 1958b:72).

Bombycilla cedrorum Vieillot
Cedar Waxwing

Like the Bohemian Waxwing the Cedar Waxwing has been reported only rarely from the upper basin, but it is likely more common, especially in winter, than the records would indicate. It is likely also that it breeds irregularly within the basin. Behle and Selander (1952:29) suspected breeding near Kanab, Kane County, Utah, May 12-13, 1946, and Beek (field notes) found it at Escalante, Garfield County, Utah, June 7, 1940. Monson (1939:168) made several observations in northeastern Arizona (Kearney Canyon) from May 8 through June 7, 1937.

Sturnus vulgaris vulgaris Linnaeus
Starling

Since 1948, at least, numerous records indicate that the Starling is now well established as a breeding bird throughout the entire upper basin. This species inhabits floodplain woods along the streams where it nests in holes in cottonwoods. It is likewise common in and around settlements. The effect of this invader on native species is unknown, although there is evidence that it can compete effectively against woodpeckers and other hole-nesting species.

Vireo solitarius plumbeus Coues
Solitary Vireo

This species is perhaps the most common vireo, at least in the Uinta Mountains and Colorado Plateau Provinces of the upper basin. It inhabits deciduous woodlands along the streams as well as the pinyon-juniper community and extends its breeding range upward to the yellow pine forests. Most of the records available are for May, June, and July, and it is likely that the species winters south of the upper basin area. The writer found a pair with half-grown young at Cottonwood Canyon, Kane County, Utah, June 16, 1960, and found a nest containing well-incubated eggs on a low branch of a yellow pine near La Sal, San Juan County, Utah, July 8, 1960. This may have been a second nesting for the season.

Examples of the race *cassinii* Xantus have been reported occasionally as migrants in the upper basin. Behle *et al.* (1958b:73) reported a sight record for Kanab, Kane County, Utah, May 12, 1946. The writer collected specimens of this race along the White River, Uintah County, Utah, September 20, 1966. Twomey (1942:437) and Woodbury and Russell (1954:117) have published records for the Uinta Basin and Navajo Mountain areas. The subspecies *plumbeus* Coues is by far the more common of the two, and is the race known to breed in the upper basin.

Vireo olivaceus (Linnaeus)
Red-eyed Vireo

The writer knows of only two published records of this species for the upper basin. Twomey (1942:437) collected it near Jensen, Uintah County, Utah, and indicated that it was a rather common migrant in that area in late May and early June and again in early September. Knight (1902:143) reported a collection made by

Drexel at Fort Bridger, Wyoming. According to the A.O.U. Checklist (1957:475) it has also been found at Green River, Wyoming.

Vireo gilvus (Vieillot)
Warbling Vireo

The Warbling Vireo is a common summer resident along the lowland streams of the upper basin where it lives in cottonwoods and other trees and taller shrubs of the floodplains. Dates of the occurrences available to the writer range from May 18 to September 9.

The subspecific status of the upper basin forms appear to be somewhat confused. Behle (1948b:77) considered the breeding birds of mountainous sections of northern Utah to be of the race *leucopolius* Oberholser and considered *swainsonii* Baird to be a migrant. Twomey (1942:437) listed the birds of the Uinta Basin, Utah, as *swainsonii*. In a later publication on the birds of southeastern Utah, Behle (1960a:43-44) used the name *swainsonii* for the birds of that area. A specimen in the Brigham Young University collection taken at Henrieville, Garfield County, Utah, September 7, 1937, has the olive back and pale olive underparts supposed to be characteristic of *swainsonii*.

Vireo vicinior Coues
Gray Vireo

The only records of this species in the upper basin known to me are those of Behle *et al.* (1958b:73) who collected several specimens in May near Kanab, Kane County, Utah, and at the confluence of Calf Creek and Escalante River, Garfield County, Utah. They state that the Gray Vireo is an inhabitant of pinyon-juniper woodland.

Vermivora celata (Say)
Orange-crowned Warbler

Orange-crowned Warblers occur throughout the upper basin as summer residents and migrants. They are found in bushy canyons or on slopes especially where the brush is rather tall, and they also range upward into the montane forests. Records of occurrence range from May to October 20.

The breeding subspecies in the basin appears to be *orestera* Oberholser, but *celata* (Say) has been frequently found in fall migration (Twomey, 1942:438; Cottam, 1942:255; Behle and Selander, 1952:30; and Behle *et al.*, 1958b:74).

Vermivora ruficapilla ridgwayi van Rossem
Nashville Warbler

The Nashville Warbler is an uncommon transient through the upper basin. According to the A.O.U. Checklist (1957:484), it nests in the Wasatch Mountains of northern Utah, but the writer has no precise record of this. Published records are rare and mostly for the fall. Woodbury and Russell (1945:119) have collection records for August 11 and 17 in the Monument Valley area of northern Arizona. Behle *et al.* (1958b:74) published a sight record for Kanab, Kane County, Utah, April 21 and Daniel *et al.* (1958:199) found it at Mesa Verde, Colorado.

Vermivora virginiae (Baird)
Virginia's Warbler

This warbler is a fairly common summer resident in the Uinta Mountains and Colorado Plateau Provinces of the upper basin. The species inhabits brushy areas along foothills and in canyons often in rather dry situations. The Brigham Young University collection contains specimens from Natural Bridges, Utah, June 27, 1927; Arches National Monument, Utah, May 9, 1950; and along the Strawberry River, Duchesne County, Utah, June 18, 1957. It has also been recorded for Vernal, Utah (A.O.U. Checklist, 1957), and from numerous other localities.

Vermivora luciae (Cooper)
Lucy's Warbler

Lucy's Warbler appears to be confined in distribution to the Colorado Plateau Province of the upper basin in summer where it is not common. The Brigham Young University collection contains a juvenile specimen taken at Calf Creek, Garfield County, Utah, July 4, 1938. Woodbury and Russell (1945:120) found it at several localities along the Colorado River in southern Utah, and Behle *et al.* (1960a:44) recorded it as a nesting bird at various localities in Glen Canyon. Lincoln (1918:327) mentions its nesting in the Four Corners area of Montezuma County, Colorado.

Parula americana (Linnaeus)
Parula Warbler

The occurrence of the Parula Warbler in the upper basin is based on a specimen collected at Gunnison, Gunnison County, Colorado, May 24, 1952 (Hyde, 1953:216). Mr. Hyde states that the specimen was a male in full song when collected.

Dendroica petechia morcomi Coale
Yellow Warbler

The Yellow Warbler is the most common breeding warbler in the upper basin area. It is found in willow thickets and deciduous trees along the streams or around the borders of lakes and ponds. It is also common in ornamental trees and shrubs of the settlements. Numerous records within the basin range from May 12 to September 6.

The upper basin population has been variously referred to the races *aestiva* (Gmelin) (Woodbury and Russell, 1945:121), *brewsteri* Grinnell (Twomey, 1942:440), and *morcomi* Coale (Behle, 1949b:77). Behle (*op. cit.*) however, considers that all breeding birds from Utah, at least, are *morcomi* and the distributional range given for this race in the A.O.U. Checklist (1957:488) would seem to confirm this. Occasional transients of *aestiva* and also *ammicola* Batchelder should be looked for.

Dendroica caerulescens (Gmelin)
Black-throated Blue Warbler

The inclusion of this species in the upper basin list is based on a record of a specimen collected October 9, 1938, at Ft. Wingate, New Mexico, and reported by Monson (1939:168).

Dendroica coronata hooveri McGregor
Myrtle Warbler

This warbler has been reported occasionally in the upper basin. Cottam (1942:254) collected it at Henry's Fork, Daggett County, Utah, in October. The writer saw one with a group of Audubon's Warblers feeding in cottonwood trees at Green River, Wyoming, May 14, 1965. Hendee (1929) collected it in Moffat County, Colorado, May 5, 1924.

Alexander (1945:623) has found evidence of hybridization between *D. coronata* and *D. auduboni*, and Phillips *et al.* (1964) consider the two to be conspecific with Audubon's Warbler being but a race of *coronata*.

Dendroica auduboni (Townsend)
Audubon's Warbler

These warblers are fairly common throughout the upper basin where they are seen as transients, usually in small flocks, feeding in wooded areas along the streams. It is likely that some of them also winter at least in the southern part of the basin. They nest mainly at higher elevations in montane forests. Gilman (1907:

194) found them nesting, however, at Shiprock, New Mexico, and they should be looked for as breeding birds elsewhere in the upper basin. All of the records available to the writer are for April, May, and September.

The specimens from the upper basin often have wing measurements somewhat larger than the coastal race *auduboni* (Townsend) and have usually been placed in the subspecies *memorabilis* Oberholser. Owing, however, to considerable variation in size, even in local populations, the subspecific relationships are not entirely clear.

Dendroica nigrescens (Townsend)
Black-throated Gray Warbler

The Black-throated Gray Warbler is one of the most common summer residents among the warblers of the upper basin. Throughout most of its range it has a decided preference for pinyon-juniper forests where it nests. It migrates during May and September at which times it may be found in small flocks in woodlands along the stream floodplains. Dates of occurrence available to the writer range from May 3 to September 20.

Dendroica townsendi (Townsend)
Townsend's Warbler

This warbler is an uncommon migrant through the upper basin especially in August. The following records of occurrence are known to the writer: Navajo Mountain area, San Juan County, Utah, August 10 (Woodbury and Russell, 1945:126); Henry Mountains, Garfield County, Utah (Stanford, 1931:8); Bogg's Crossing, Moffat County, Colorado (Cooke, 1909:420); 17 miles north of Neola, Duchesne County, Utah, August 24, 1957 (Killpack and Hayward, 1958:24); and Bluff, San Juan County, Utah, September 13, 1966 (Brigham Young University collection).

Dendroica graciae Baird
Grace's Warbler

Woodbury and Russell (1945:125) have published a record of this species. They obtained a specimen and made several observations in the Navajo Mountain area, San Juan County, Utah. They noted the bird only in yellow pine woods, but it is not unlikely that it occurs in pinyon-juniper. Their dates of record range from June 15 to July 16. Behle (1960a:45) mentions several other records from southern Utah, but they are for higher elevations than this report includes.

Sciurus noveboracensis notabilis Ridgway
Northern Waterthrush

The Northern Waterthrush appears as an occasional migrant in the upper basin both in spring and early fall. The following published records are known to the writer: Uinta Basin, Utah, May 8 and August 11 (Twomey, 1942:445); Bluff, San Juan County, Utah, May 11-22 (Woodbury and Russell, 1945:125); Linwood, Daggett County, Utah, May 20 (Cottam, 1942:255); Fort Bridger, Uinta County, Wyoming (Knight, 1902:150); Shiprock, New Mexico (Gilman, 1908:150); 18 miles southwest of Natural Bridges Monument, San Juan County, Utah, May 13, 1960 (Behle, 1966:396).

Oporornis tolmiei (Townsend)
MacGillivray's Warbler

This warbler has been recorded throughout most of the upper basin. It occupies intermediate elevations along foothills and in canyons wherever there is brushy vegetation. Dates of occurrence within the basin range from May 12 to September 16.

The breeding subspecies appears to be *monticola* Phillips. Behle (1960a:46) states that the race *tolmiei* (Townsend) appears as a transient in the basin, but all specimens examined by the writer are very uniform in color and size and seem to be *monticola*.

Geothlypis trichas (Linnaeus)
Yellowthroat

The Yellowthroat is a fairly common breeding warbler wherever there are suitable habitats within the upper basin. It inhabits tule and cattail vegetation around the borders of ponds and also occurs in willow thickets near water. Dates of occurrence extend from May 1 to September 16.

The more northern and larger race *occidentalis* Brewster is the common breeding subspecies but it is possible that *scirpicola* Grinnell may be found nesting in the southern part of the basin. Specimens of *campicola* Behle and Aldrich may also occasionally occur as transients in the upper basin (Behle, 1948b:78).

Icteria virens auricollis (Deppe)
Yellow-breasted Chat

This species is a consistent summer resident at least in the Uinta Mountains and Colorado Plateau Provinces of the upper basin. Its status

in the Green River Basin Province is unknown to the writer. The Yellow-breasted Chat occupies dense shrubby vegetation along the waterways or around the borders of ponds. Records of occurrence extend from May 12 to September 20.

Wilsonia pusilla pileolata (Pallas)
Wilson's Warbler

Wilson's Warbler breeds in the mountains and appears commonly as a migrant at lower elevations in the basin. During migration it is seen in wooded areas along the streams. Behle *et al.* (1958b:77) found it at Kanab, Kane County, Utah, as early as April 28 and I found small flocks moving through Castle Valley, Grand County, Utah, on June 6. The writer also found them to be very common along the White River, 3 miles south of Bonanza, Utah, September 19-20, 1966. They were feeding in cottonwoods and tall rabbitbrush.

Setophaga ruticilla tricolora (Müller)
American Redstart

The American Redstart is an uncommon breeding bird in the upper basin. It lives along wooded streambanks at lower elevations. Published records of its occurrence are as follows: Uinta Basin, August 20 and September 20 (Twomey, 1942:449); Uinta Basin, June 12 and September 3 and in Daggett County, September 12 (Behle and Selander, 1952:31); Bogg's Crossing, Moffat County, Colorado (Cooke, 1909:420); Shiprock, New Mexico, May 27 (Gilman, 1908:151).

Passer domesticus domesticus (Linnaeus)
House Sparrow

The House Sparrow is a common species throughout the upper basin but is confined almost entirely to the vicinity of towns and ranches.

Dolichonyx oryzivorus (Linnaeus)
Bobolink

Since the habitat of the Bobolink is limited rather strictly in the intermountain area to wet pasturelands, its distribution seems to be somewhat spotty and irregular. Judging from the reference to it in the literature it is not at all common. Woodbury and Russell (1945:129) refer to two specimens collected by the American Museum of Natural History at Bluff, San Juan County, Utah, May 19, 1892, but these may have been transients. Cooke (1909:415) reports speci-

mens collected at Meeker, Rio Blanco County, and Steamboat Springs, Routt County, Colorado. Hyde (1953:216) found it nesting at Gunnison, Gunnison County, Colorado. Hopkins (1906:461) reported it from several localities along the White River, Colorado, where it was seen in late spring and early summer. There is also an old collection record from Fort Bridger, Wyoming, reported by Knight (1902:111).

Sturnella neglecta neglecta Audubon
Western Meadowlark

The meadowlark is well distributed over the upper basin wherever there is suitable habitat. It is perhaps most common on irrigated farmlands where there are open fields and pastures, but it is also found along river floodplains. Most of the numerous records available to the writer are for April through September. Behle *et al.* (1958b:77) found them in Kanab, Kane County, Utah, in December. A few might be found in winter anywhere in the basin, especially where there are cattle or sheep feed grounds where they can pick up some grain. They are also sometimes seen in winter along blacktop highways where the snow has been removed and ground exposed.

Xanthocephalus xanthocephalus
(Bonaparte)

Yellow-headed Blackbird

The Yellow-headed Blackbird is widespread wherever there are marshy areas in the upper basin. Irrigation and the creation of reservoirs in recent years have produced habitats of emergent vegetation suitable for their nesting and the number of colonies seems to be on the increase. Dates of occurrence range from April 14 to the last of September. At Pelican Lake, Uintah County, Utah, where there is a large nesting colony, nesting occurs in early June. The nests are attached to *Scirpus* which grow rather sparsely in about two feet of water. Feeding takes place around the borders of the lake where willow and tamarisk grow and where there is an abundance of midges during this season. The writer saw large blocks of these blackbirds over the San Juan River in the Four Corners area in early September, 1966.

Agelaius phoeniceus fortis Ridgway
Redwinged Blackbird

This species is common in the upper basin wherever there are marshlands or open pastures.

It seems to prefer marshes with emergent vegetation as nesting sites, but it will also build its nests on the ground in wet, grassy pastures. It remains in many parts of the basin throughout the winter, especially in the more central and southerly parts. At Kanab, Kane County, Utah, the writer found it paired and preparing to nest as early as April 8, but in the Uinta Basin a colony was nesting on June 2.

Behle (1941:183) has referred some of the specimens from southern Utah to the race *utahensis*. However, this name was not recognized in the A.O.U. Checklist and the name *fortis* Ridgway is used in this report.

Icterus parisorum Bonaparte
Scott's Oriole

Scott's Oriole is an uncommon summer resident in the Colorado Plateau and Uinta Mountains Provinces of the upper basin. The writer has no records of its occurrence in the Green River Basin Province. It is known to nest as far north as the Uinta Basin (Twomey, 1945:131). Behle *et al.* (1958b:78) found it at Kanab, Kane County, Utah, on May 1 but records are too few to indicate the length of its residence in the basin.

Icterus bullockii bullockii (Swainson)
Bullock's Oriole

Numerous records indicate that this oriole is a common summer resident in wooded areas along the lowland streams and in orchards and ornamental trees in settled communities. It is found throughout the upper basin. The earliest record available to the writer is for May 5 when a specimen was collected at Bluff, San Juan County, Utah. It was found as far north as La Barge Creek, Sublette County, Wyoming, on May 14. Most of the earlier dates are for about the middle of May. Twomey (1942:454) found that they left the Uinta Basin about the middle of September.

Euphagus cyanocephalus (Wagler)
Brewer's Blackbird

Brewer's Blackbird is one of the more common blackbirds throughout the upper basin. It is frequently seen along roadways and around the borders of fields especially where there are shrubs or trees for nesting sites. It also frequently feeds on lawns in parks and around private dwellings. In more isolated places it also occurs in wooded areas along the valley streams. These blackbirds are more abundant in summer from

late April through September, but some of them also winter in the basin where they may be found with Redwinged Blackbirds feeding around cattle and sheep feed grounds.

Quiscalus quiscula (Linnaeus)
Common Grackle

I have been able to find but a single published record of the Grackle for the upper basin. Knight (1902:118) reports a specimen supposedly collected by Drexel at Fort Bridger, Wyoming, in 1858. Dr. Drexel reported that the species was rare. The writer saw a pair at close range at Daniel, Sublette County, Wyoming, May 28, 1966. There were indications from their actions that they were preparing to nest.

Molothrus ater artemisiae Grinnell
Brown-headed Cowbird

The cowbird is a rather common summer bird in all parts of the upper basin. The writer found them at Adairville, Kane County, Utah, as early as April 7, but most of the earlier records are for mid-May. Twomey (1942:456) found them in the Uinta Basin in late July, but they must remain in the basin somewhat later than this. They are more common around settlements and on wooded floodplains. However, they are sometimes seen in open desert country where livestock are being pastured or fed.

Piranga ludoviciana (Wilson)
Western Tanager

The Western Tanager is seen in the upper basin mainly as a migrant when it passes through the lower country in early summer and fall. It nests in montane forests at higher elevations, but its stay there is brief. Spring migrants, usually in pairs, are frequently seen in wooded areas along the streams in the Uinta Basin as late as June 2, and by July 22 the birds again appear in the lowlands. The possibility that some may nest along the stream floodplains at lower elevations, as well as in the mountains, needs further investigation. The earliest date of appearance at Kanab, Kane County, Utah, is May 4, and the latest is September 20 reported by Behle *et al.* (1958b:79).

Piranga olivacea (Gmelin)
Scarlet Tanager

The inclusion of this species in the upper basin list is on the basis of reports by Rockwell (1908:174) of a specimen taken in Mesa

County, presumably near Grand Junction, June 4, 1904. He also mentions two specimens taken by Cooke at Newcastle, 70 miles east of Grand Junction in 1892.

Pheucticus ludovicianus (Linnaeus)
Rose-breasted Grosbeak

Behle (1966:37) has reported a specimen from the headquarters area, Arches National Monument, Utah, taken May 26, 1965.

Pheucticus melanocephalus melanocephalus
(Swainson)
Black-headed Grosbeak

A rather common summer resident in the upper basin, the Black-headed Grosbeak occurs along the floodplain woodlands where it nests usually on the lower limbs of cottonwoods or in tall shrubs. Rockwell (1908:173) found it from April 20 to October 2 at Grand Junction, Colorado, but most of the birds seem to arrive at the breeding grounds about mid-May. The writer found them to be common at Henrieville, Garfield County, Utah, on September 7.

Guiraca caerulea interfusa
Dwight and Griscom
Blue Grosbeak

This species was formerly thought to be confined to the Colorado Plateau Province in the basin, but it is now known to occur in the Uinta Mountains Province as well (Behle and Selander, 1952:31; and Killpack and Hayward, 1958:24). The Blue Grosbeak inhabits wooded or bushy areas near water. Judging from the dates available to the writer this species arrives at the breeding grounds in late May or early June and remains until about mid-September.

Passerina amoena (Say)
Lazuli Bunting

The Lazuli Bunting is a fairly common summer resident throughout the upper basin. It prefers thickets and cottonwood woodlands along the streams or along ditch banks. The writer found it at Duchesne, Duchesne County, Utah, as early as May 12 and at Henrieville, Garfield County, Utah, on September 9.

Spiza americana Gmelin
Dickcissel

Only one record of this species for the Upper Basin is known to the writer. McCrimmon,

(1925:550) reported it from Montrose, Colorado, and believed it to be breeding there.

Hesperiphona vespertina brooksi Grinnell
Evening Grosbeak

This grosbeak has been rarely reported for the upper basin presumably because it is principally a winter visitor at lower elevations. Its appearances even in winter are irregular which may also account for the paucity of records. Rockwell (1908:170) found it both in summer and winter in Plateau Valley, Mesa County, Colorado. The Brigham Young University collection contains two specimens taken at Roosevelt, Duchesne County, Utah, December 31, 1955, and February 14, 1956.

Carpodacus cassinii Baird
Cassin's Finch

Cassin's Finch is a summer resident of the Montane Forest and appears at lower elevations as a migrant especially in the spring. The writer found a large flock near Kanab, Kane County, April 8, 1960, and there are several other early spring occurrences reported. Nesting occurs in the yellow pine community and at comparable elevations in other forested areas. The species should be looked for in the pinyon-juniper community where a few most likely breed.

Carpodacus mexicanus frontalis (Say)
House Finch

The House Finch is one of the more common birds inhabiting the upper basin. It is common in wooded areas along the streams but is also found in rather dry situations some distance from water. They are seemingly more abundant in the more southerly parts of the basin where they are in continuous residence throughout the year. While it is likely that some birds remain all winter in the northern parts of the basin, there appears to be a general southward shift in late autumn to more sheltered areas in the southern canyons and valleys where snowfall is light and the ground is more exposed for feeding. At the old townsite of Adairville, Kane County, I found large flocks of wintering House Finches in December.

Leucosticte tephrocotis (Swainson)
Gray-crowned Rosy Finch

The Brigham Young University collection contains five specimens of the Gray-crowned

Rosy Finch collected from a flock of wintering birds at Myton, Duchesne County, Utah, March 9, 1958. Of these specimens two appear to be of the race *tephrocotis* (Swainson) and three are *littoralis* Baird based on the differentiation of the two given by Ridgway (U. S. Nat. Mus. Bull. 50:68, 1901).

Leucosticte atrata Ridgway
Black Rosy Finch

This species, which is the breeding rosy finch in the high mountains of Utah and Wyoming, winters at lower elevations in the upper basin in large, irregular flocks. Frost and Murphy (field notes) found a flock estimated at 200-300 birds near Moab, Grand County, Utah, December 19, 1961, and the writer collected two specimens from a similar flock north of Vernal, Uintah County, Utah, May 13, 1961. Two specimens were also collected near Randlette of the same county, May 6, 1950. On the wintering areas these finches are more often seen flying in rather close flocks restlessly from place to place alighting for short periods to feed on the ground.

Acanthis flammea flammea (Linnaeus)
Common Redpoll

The Common Redpoll has rarely been reported from the upper basin although it should be expected in winter in lower canyons especially in the Green River Basin Province. Cottam (1942:254) reported a specimen collected at the mouth of Henry's Fork, Daggett County, Utah, October 10, 1870. Killpack and Hayward (1958:24) reported collections and sight records from near Roosevelt, Duchesne County, Utah, January 1, 1958. Knight (1902:123) records specimens collected by the Hayden Survey at Green River, Wyoming.

Spinus pinus pinus (Wilson)
Pine Siskin

The Pine Siskin is a rather common species throughout the upper basin. It nests primarily in conifer forests of the mountains, but it is also found breeding at lower elevations. It is likely that a few remain all winter even in the more northern parts of the basin, but most of the wintering birds are found in more southerly localities where the ground remains bare of snow most of the time and where there is a plentiful supply of seeds.

Spinus tristis pallidus Mearns
American Goldfinch

This species is fairly common throughout the upper basin and occurs there as a year-round resident, at least in parts of it. The birds occupy the floodplain woodland in spring and summer or live in woodlots and ornamental trees around settlements. They seem to prefer the vicinity of ample water. In winter they may be found in their more sombre winter plumage feeding in flocks wherever there is bare ground or exposed vegetation bearing seeds. On December 30, 1957, the writer found large flocks of goldfinches feeding with flocks of House Finches at Adairville townsite, Kane County, Utah.

Spinus psaltria hesperophilus (Oberholser)
Lesser Goldfinch

The Lesser Goldfinch occurs as a summer resident in much of the upper basin as far north as Daniel, Sublette County, Wyoming, but it is probably more common toward the south. It is apparently a winter resident also over most of its range but there appears to be some southward shift at that season. The species lives in wooded areas along the lowland streams and also in trees around the settlements. It feeds frequently on the ground as well as in the trees.

Loxia curvirostra Linnaeus
Red Crossbill

The Red Crossbill is confined almost entirely to the montane forests where it breeds irregularly. It is frequently found in the isolated ranges of the southern upper basin living in forests of yellow pine, and it is not unlikely that it occurs to some extent in pinyon-juniper. It has been found in yellow pine (Abajo Mountains, San Juan County, Utah, Brigham Young University collection) and in a similar habitat near La Sal, San Juan County (Behle, 1960a:50). Behle and Ghiselin (1958a:18) collected it three miles south of Vernal, Uintah County, Utah, which must have been at a rather low elevation.

The crossbill population of the upper basin has been referred at various times to the races *bendirei* Ridgway, *benti* Griscom, *grinnelli* Griscom, and *stricklandi* Ridgway. Owing to the wandering habits of this species and their erratic breeding most any one of these races may be found. Specimens showing intermediate characters of several races have been collected. Some of these problems have been discussed by Selander (1953:158) and by Behle (1960b:23). It

seems likely that the subspecies *benti* is the most common breeding form in the upper basin.

Chlorura chlorura (Audubon)
Green-tailed Towhee

The Green-tailed Towhee is a summer resident in the upper basin where it breeds in brushy communities along the foothills. As a migrant, especially in late April and early May, it is found along the floodplain woodlands at lower elevations. Following the nesting season these towhees often extend into higher elevations in the mountains where they live into late summer. Fall migration occurs in September (Twomey, 1942:466).

Pipilo erythrophthalmus montanus Swarth
Rufous-sided Towhee

This towhee is known to occur in the Uinta Mountains and Colorado Plateau Provinces. It occupies brushy areas along the stream floodplains and adjacent areas where it nests. It is usually found at somewhat lower elevations than the Green-tailed Towhee but the ranges of the two may overlap in the foothills. There may be some migration southward in winter but individual birds remain throughout the year even in the northern part of their range. One specimen in the Brigham Young University collection was taken at Myton, Duchesne County, Utah, December 27, 1956.

Calamospiza melanocorys Stejneger
Lark Bunting

The Lark Bunting occurs regularly, although uncommonly, in all of the provinces of the upper basin. Some sixteen records available to the writer range from May 17 to September 9. This species is much more common as a breeding bird east of the continental divide, but there is evidence that it nests also in the upper basin. Gilman (1907:157) found it nesting in June in southwestern Colorado. There are a number of records of occurrence in the basin in late May and June but no positive nesting records have been noted. These records and dates include those of Porter and Egoscue (1954:220) for the Uinta Basin on June 12, 1953; Behle and Ghiselin (1958b:15) for Jensen, Uintah County, Utah, June 10, 1952; Killpack (1951:99) for two localities in the Uinta Basin, May 21 and 26, 1950; and Rockwell (1908:173) for the Mesa County area of Colorado in summer. Killpack (*op. cit.*) did not believe that the birds he saw in late May

were nesting although he noted that the testes were enlarged. The writer saw Lark Buntings at several points along the roadway between Kemmerer and Daniel, Wyoming, May 28, 1966, but found no positive evidence of nesting. The Lark Bunting is most often seen in flocks in open country where low shrubby vegetation is predominant.

Passerculus sandwichensis nevadensis
Grinnell

Savannah Sparrow

The Savannah Sparrow is rather common wherever there is suitable habitat within the basin. This species inhabits fields and open meadow country preferably where there are shallow ponds. It is, therefore, rather limited to areas where there are streams bordered by lands that are occasionally flooded. Records of occurrence range from March 17 to July but it is likely that some birds winter, at least in the more southern parts of the basin. The writer found this to be the most common sparrow at Daniel, Sublette County, Wyoming, May 15, 1965.

Ammodramus savannarum Gmelin
Grasshopper Sparrow

The inclusion of this sparrow in the upper basin list is based on a specimen collected at Gunnison, Gunnison County, Colorado, October 15, 1953, and reported by Hyde (1958:53).

Passerherbulus caudacutus (Latham)
Le Conte's Sparrow

A specimen reported by Hyde (1958:68) was collected at Gunnison, Gunnison County, Colorado, October 24, 1952. This is the only record for the upper basin known to the writer.

Pooecetes gramineus (Gmelin)
Vesper Sparrow

This sparrow occurs as a breeding species throughout the upper basin. Eighteen locality records within the basin range from April 3 to mid-October. Vesper sparrows prefer a habitat of low to medium height desert shrubs sometimes rather far removed from water.

The subspecies *confinis* Baird is the most common race both as a breeding form and in migration. Behle (1960:51) has reported the occurrence of *affinis* Miller as a transient in the La Sal and Henry Mountains.

Chondestes grammacus strigatus Swainson
Lark Sparrow

The Lark Sparrow is among the more common sparrows occupying the upper basin. About 32 locality records available extend from April 21, 1961, through September (Twomey, 1942:470). Nesting is more common in sagebrush or other medium height shrubs, but the Lark Sparrow is less of a ground dweller than the Vesper Sparrow and is more often seen in taller shrubs or trees.

Amphispiza bilineata deserticola Ridgway
Black-throated Sparrow

This species is truly a desert inhabitant where it is found commonly living in dry communities where shadscale and small rabbitbrush predominate. It is indicated in the A.O.U. Checklist (1957:604) that the Black-throated Sparrow inhabits southwestern Wyoming, but of 27 locality records available to the writer all are for the Colorado Plateau Province. Twomey (1942) did not find it in the Uinta Mountains Province nor have I ever seen it there. Near Wahweap, Kane County, Utah, the writer found this species nesting on May 20, 1956. The nest was located in a small rabbitbrush about a foot from the ground and contained two fresh eggs. It was a deep cup composed of coarse grass and lined compactly with fine grass. Among the records of occurrence available, the earliest is for May 2 and the latest is for mid-August.

Amphispiza belli nevadensis (Ridgway)
Sage Sparrow

This sparrow is widely distributed throughout the upper basin in all the provinces but seems to be rather uncommon. It is principally a summer resident primarily in desert shrub communities. A specimen in the Brigham Young University collection was taken at Roosevelt, Duchesne County, Utah, April 1, 1950, but Frost and Murphy (field notes) found it along the Colorado River south of Moab as early as March 8. They also saw it in the same area on October 19. Indications are that some of these birds winter in the southern parts of the basin.

Junco hyemalis (Linnaeus)
Slate-colored Junco

Juncos are common wintering birds in the upper basin especially in the more southern parts of the area where winter feeding condi-

tions are more favorable. They arrive in the lowlands usually in September and October and remain well into the spring. The writer found them at Duchesne, Duchesne County, Utah, as late as May 12.

Several forms which have been considered in the past to represent distinct species (A.O.U. Checklist, 1957:607-612) are now thought to be subspecies by some authorities (Brodkorb and Blair *et al.*, 1957:612). By far the more common of these in the upper basin is a variable group that has been given species rank under the name *oreganus* (Townsend) with several subspecies including *montanus* Ridgway, *mearnsi* Ridgway, and *shufeldti* Coale. All of these forms can be recognized in the upper basin population. Of much less common occurrence are representatives of a group called *hyemalis* (Linnaeus) and another group known as *caniceps* (Woodhouse). Both of these forms have been given species rank in the past. The form called *caniceps* breeds in mountains bordering and within the southern part of the basin while *mearnsi* nests in the more northern mountains. Representatives of all these forms whether they are actually species or subspecies may be found in flocks wintering within the upper basin. If all of these kinds are actually representatives of a single species, they would, according to priority, be placed under the species name *hyemalis*.

Spizella arborea ochracea Brewster
Tree Sparrow

The Tree Sparrow has been reported as a winter resident in all of the provinces of the upper basin. Twelve locality records available range from October to as late as May 5. The birds usually appear in flocks especially in patches of willows or in floodplain woodlands.

Spizella passerina arizonae Coues
Chipping Sparrow

As a nesting bird the Chipping Sparrow seems to prefer yellow pine forests or higher montane forests. Hardy (1954:536) found them nesting in pinyon-juniper in Carbon County, Utah, and the writer found them in the same type of habitat in Uintah County, Utah. A few may also nest along the floodplain woodlands as indicated by Gilman (1907:157). The early spring migrants arrive in the basin about mid-April at which time they are often seen in small flocks. In September migrant flocks are again seen in lower elevations in wooded areas along

the streams or in more desert shrub communities.

Spizella breweri breweri Cassin
Brewer's Sparrow

Brewer's Sparrow prefers sagebrush or other low growing desert shrubs in which to nest. It occurs commonly in all such habitats everywhere within the upper basin. In September large flocks of these birds may be seen along roadways where they appear to be feeding on the seeds of weeds that usually grow in such places. Their occurrence in the basin extends from about the middle of April well into September. The earliest date available to me is from Moab, Grand County, April 3 (Behle, 1960a:153). Twomey (1942:473) found them beginning the fall migration in the Uinta Basin in late September (September 21).

Zonotrichia querula (Nuttall)
Harris' Sparrow

The writer has been able to find a few scattered records of Harris' Sparrow wintering in the upper basin. These records are as follows: Fruita, Mesa County, Colorado, November 1, 1925 (Bergtold, 1926:245); Linwood, Daggett County, Utah, November 26, 1916 (Cottam, 1942:355); Price, Carbon County, Utah (Behle, 1960a:54); Myton and Roosevelt, Duchesne County, Utah, December 3, 1955, and January 15, 1957 (Killpack and Hayward, 1958:25); Gunnison, Gunnison County, Colorado, November 5, 1952 (Hyde, 1953:216).

Zonotrichia leucophrys (Forster)
White-crowned Sparrow

This sparrow is common in autumn, winter, and spring throughout the upper basin. It occurs in flocks in brushy habitats along the streams and around the settlements. They winter in greater numbers southward in the basin where the ground is more exposed. Gilman (1908:149) found them at Shiprock, New Mexico, in winter, and Frost and Murphy (field notes) recorded them south of Moab, Grand County, Utah, December 19, 1961. Probably most of the flocks seen in fall and spring are composed of migrants. In spring the greatest numbers are seen in April and May. The latest spring date is for June 4, 1957, at which time they were seen at the junction of the San Rafael and Green Rivers, Emery County, Utah, (author's field notes). Fall migration occurs

mostly in September. The earliest fall date available is for September 7 when they were found at Henrieville, Garfield County, Utah (author's field notes).

Both the race *gambelii* (Nuttall) and *oriantha* Oberholser occur in the upper basin with *oriantha* being the more common of the two. The latter subspecies is the form breeding in the mountains that border the upper basin.

Zonotrichia albicollis (Gmelin)

White-throated Sparrow

Hyde (1953:216) reports a sight record of this species for Gunnison, Gunnison County, Colorado, November 11, 1952. This is the only record of this species for the upper basin known to the writer.

Passerella iliaca (Merrem)

Fox Sparrow

The Fox Sparrow seems to be an uncommon species within the upper basin, but it probably occurs in small numbers in summer in habitats of dense thickets along all of the waterways. Nearly all of the records available to me are for Colorado. Hyde (1953:216) found it at Gunnison from May to July. Gilman (1907:157) recorded it for Ft. Lewis, La Plata County, in spring. Rockwell (1908:173) reported it from Glenwood springs and Hendee (1929) collected it in late April in Moffat County. Lincoln (1913:114) found it nesting near Grand Junction. There is also one record for Fort Bridger, Uinta County, Wyoming (A.O.U. Checklist, 1957:625). Behle (1960a:53) reported specimens collected in the La Sal Mountains.

It is possible that both the subspecies *schistacea* Baird and *swarthi* Behle and Selander occur within the basin. The A.O.U. Checklist (1957:621) records the specimens from Fort Bridger as *schistacea* while Behle (1960a:53) lists *swarthi* as the race living in the La Sal Mountains. The specimens from Fort Bridger are considered by Behle and Selander (1951:365) to be of uncertain status.

Melospiza lincolnii (Audubon)

Lincoln's Sparrow

Lincoln's sparrow occurs in the upper basin as a spring and fall migrant. The populations at

these seasons is made up of two races but only one of these nests in the surrounding mountains. Most of the migrating individuals are seen in May and late September (Twomey, 1942:475). Gilman (1908:150) reported seeing a few of these sparrows at Shiprock, San Juan County, New Mexico, in February and March.

The races *lincolnii* (Audubon) and *alticola* (Miller and McCabe) both occur in the migrating populations (Twomey, 1942:475; Behle, 1941b:184 and 1960a:53). The subspecies *alticola* is the breeding form in bordering mountain ranges.

Melospiza melodia (Wilson)

Song Sparrow

The Song Sparrow is a fairly common species in thicket habitats along the natural streams as well as irrigation canals near settlements. They are present throughout the year and often begin singing in late February.

The distribution of the subspecies of Song Sparrows within the basin is not well known. Behle (1948b:79) has discussed the occurrence of the races in Utah and concludes that *montana* Henshaw is the breeding form in that area. The races *juddi* Bishop (Twomey, 1942:476), *fallax* (Fuller & Bole, 1930:75), and *merrilli* Brewster (Behle, 1944:86) have been reported at different times.

Calcarius lapponicus alascensis Ridgway

Lapland Longspur

The Lapland Longspur has been reported as a wintering species in several parts of the upper basin. The Brigham Young University collection contains six specimens collected in the Uinta Basin in December and January (Killpack, 1953:152). Hyde (1953:216) reports specimens taken at Delta and Gunnison, Colorado, in November and December, 1952, and Gilman (1907:156) records a specimen taken by Warren at Cortez, Montezuma County, Colorado, April 3, 1906.

Plectrophenax nivalis nivalis (Linnaeus)

Snow Bunting

The only record of this species known to the writer is one reported by Killpack (1953:152). He reported a specimen collected at Fort Duchesne, Uintah County, Utah, January 14, 1952.

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**Brigham Young University
Science Bulletin**

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HARVARD
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**TAXONOMIC REVIEW: MIRIDAE
OF THE NEVADA TEST SITE
AND THE
WESTERN UNITED STATES**

by

HARRY H. KNIGHT



BIOLOGICAL SERIES—VOLUME IX, NUMBER 3

JANUARY, 1968

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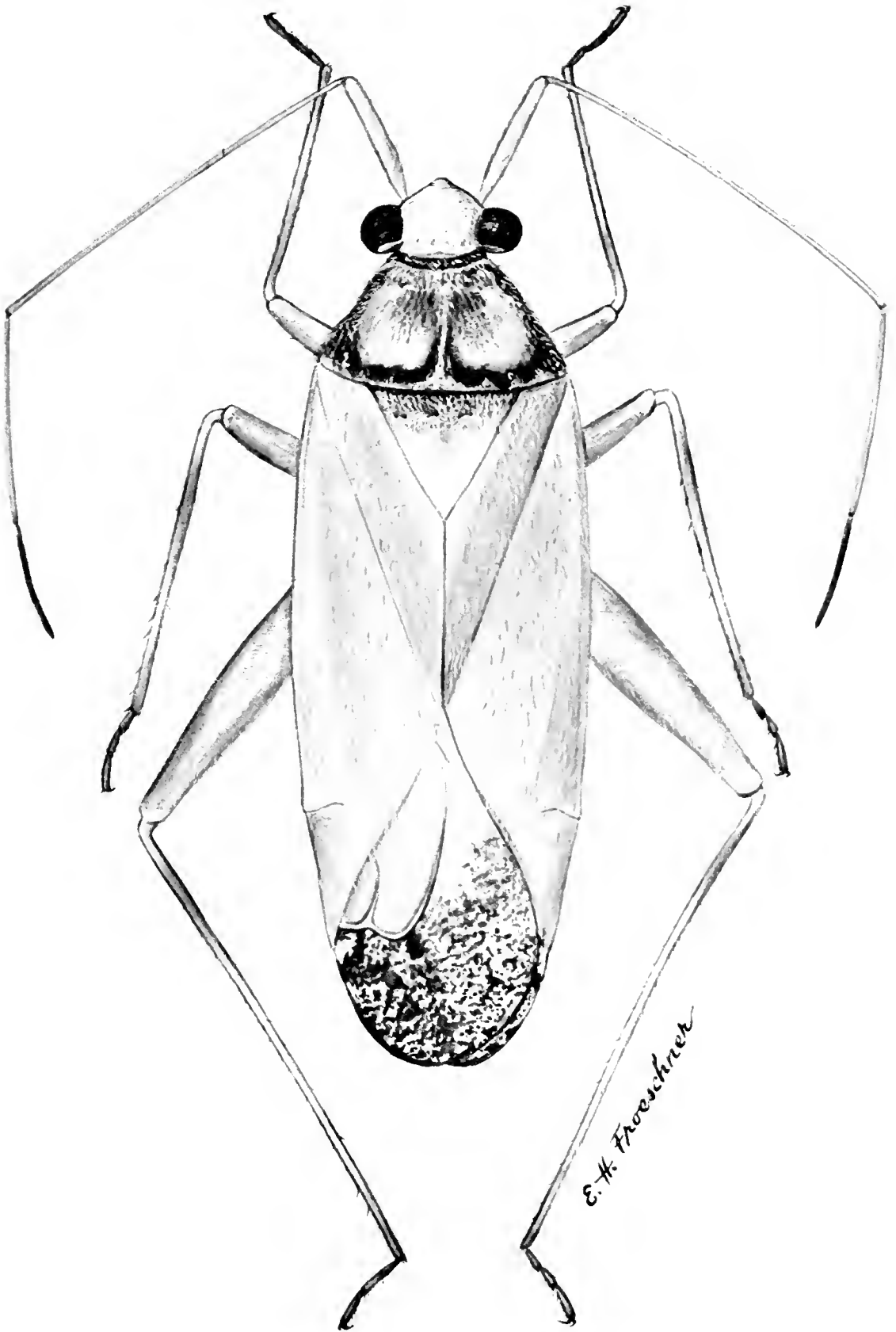
by

HARRY H. KNIGHT



BIOLOGICAL SERIES—VOLUME IX, NUMBER 3

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Phytocoris becki, n.sp.

FOREWORD

This paper is dedicated to our esteemed colleague, Dr. D Elden Beck, student of the author and teacher of the editor, who passed away during the printing of this treatise and wanted so much to see the completion of this and other worthy projects in his many areas of interest.

Harry H. Knight and Dorald M. Allred

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"	<i>fuscosignatus</i>	258	215	"	<i>nicholi</i>	237	158
"	<i>gracillatus</i>	278	231	<i>Pilophorus taxodii</i>		241	167
"	<i>heidemanni</i>	266, 267, 224,	228	<i>Pithanus maerkelii</i>		26	20
"	<i>hesperellus</i>	264	224	<i>Platylygus vanduzeei</i>		249	191
"	<i>hesperius</i>	263	224	<i>Platytyellus insiticus</i>		67	22
"	<i>juniperanus</i>	302	245	<i>Prepops fraternus</i>		245	181
"	<i>lasiomerus</i>	64	22	<i>Psallus ancorifer</i>		39	22
"	<i>laticeps</i>	300	242	<i>Pseudatomoscelis seriatus</i>		75	55
"	<i>lenis</i>	288	235	<i>Pycnoderes medius</i>		100	77
"	<i>lineatellus</i>	309	251	<i>Reuterocarpus ornatus</i>	43, 76	22, 55	
"	<i>longihirtus</i>	257	215	<i>Rhinocapsus vanduzeei</i>		40	22
"	<i>mellarius</i>	265	224	<i>Schaffneria schaffneri</i>		233	156
"	<i>merinoi</i>	271	229	<i>Semium hirtum</i>		107	88
"	<i>mesillac</i>	314	257	<i>Sericophanes heidemanni</i>		239	160
"	<i>minituberculatus</i>	307	250	<i>Sixconotus insignis</i>	50, 99	22, 76	
"	<i>minuendus</i>	298	242	<i>Slaterocoris croceipes</i>		110	91
"	<i>nigrolincatus</i>	262	224	"	<i>longipennis</i>	114	91
"	<i>picicola</i>	283	233	"	<i>robustus</i>	112	91
"	<i>plenus</i>	276	230	"	<i>rubrofemoratus</i>	111	91
"	<i>politus</i>	269	229	"	<i>sherridani</i>	113	91
"	<i>quadriannulipes</i>	270	229	"	<i>stygius</i>	108	89
"	<i>quadricinctus</i>	316	257	"	<i>utahensis</i>	115	91
"	<i>relativus</i>	299	242	<i>Spanagonicus albofasciatus</i>		69	31
"	<i>reticulatus</i>	260	217	<i>Squamocoris utahensis</i>		140	108
"	<i>rinconae</i>	295	238	<i>Strongylocoris stygius</i>		57	22
"	<i>rostratus</i>	310	251	<i>Stenodema trispinosum</i>		63	22
"	<i>salicis</i>	282	232	<i>Stittocapsus frauseriae</i>		22	20
"	<i>santaritae</i>	294	238	<i>Taccia salicis</i>		254	205
"	<i>simulatus</i>	268	229	<i>Teleorhinus cyaneus</i>		83	65
"	<i>sonorensis</i>	305	250	"	<i>tephrosicola</i>	27	20
"	<i>stellatus</i>	272	229	<i>Teratorcoris discolor</i>		244	181
"	<i>stitti</i>	275	230	<i>Tropidosteptes populi</i>		247	186
"	<i>subcinctus</i>	311	251				

TAXONOMIC REVIEW: MIRIDAE (HEMIPTERA) OF THE NEVADA TEST SITE AND THE WESTERN UNITED STATES

By

Harry H. Knight*

INTRODUCTION

The writer first learned of the research carried on at the Nevada Test Site from a visit by Dr. D Elden Beck in the spring of 1964. We talked about the possibility of collecting Miridae and perhaps working up the species for a list from the test site. That summer Dr. Beck arranged to have a graduate student do some collecting and pay special attention to the plant bugs. It was a dry year, perhaps average for that area, and only some 200 specimens of Miridae were collected. It is well known that desert vegetation remains dormant until good rains occur in the fall or early spring, then takes on new life with foliage and bloom, the extent of growth depending on the moisture available. With reports of far above average rainfall in the winter and early spring of 1965 in the desert southwest, the writer decided it might be a good year for plant bugs, so accepted an invitation of Dr. Beck to put in a month of collecting at the peak of the blooming season for much of the desert vegetation. The final decision was not made until late spring when reports came in that lowland vegetation was abundant and promising abundant bloom. As predicted, it turned out to be a good year collecting plant

bugs; and some old residents of southern Utah, as well as Dr. Beck, were of the opinion that rarely if ever had they seen the desert areas blooming so abundantly. Years before, while with the Cornell University Biological Expedition (1917), I had found plant bugs in Arizona most abundant where and when the vegetation produced heavy bloom.

In 1965 most of the collecting was done from June 10 to June 24 inclusive, when I was there on a full-time basis along with Mr. Joe M. Merino, a graduate student, and with a few days help from Dr. Beck. Mr. Merino continued to collect part time during July and August while doing research on parasites of rodents. All told we collected close to 5,000 specimens of Miridae which now have been classified and recorded in the present publication. From the general insect collections of 1961 and 1964 inclusive, we sorted out about 300 specimens of Miridae and found four or five species that were not collected in 1965. Now with the material all classified, we count some 160 species of Miridae taken at the test site. I believe that with more collecting of Miridae at the test site, the list should number over 250 species.

ACKNOWLEDGMENTS

I am indebted to Dr. D Elden Beck and Dr. Donald M. Allred, project supervisors, who invited me to participate in this project, and provided for all the necessary facilities to carry on the research. I am especially grateful to Dr. Beck and family, who invited me and my wife to make their home our headquarters while we were in Provo, Utah. Dr. Beck drove his car to transport me to the test site, and arranged facilities and laboratory space for my work in the recently constructed Civil Effects Test Operations research building at Mercury. I wish to thank Dr. Allred for his help as editor of

the Science Bulletin, and seeing the manuscript through the press. I want to thank Mr. Joe M. Merino for his help with the field work and for serving as my guide, chauffeur, and an excellent collector. He did everything possible to make my stay at the test site pleasant and profitable.

Dr. Janice C. Beatley identified many of the plant species encountered in these collections. Dr. Beatley is in charge of the Nevada Test Site Herbarium. She is a member of the ecological staff located at the test site under jurisdiction of the University of California Laboratory of

*Professor of Entomology, Iowa State University, Ames, Iowa 50010.

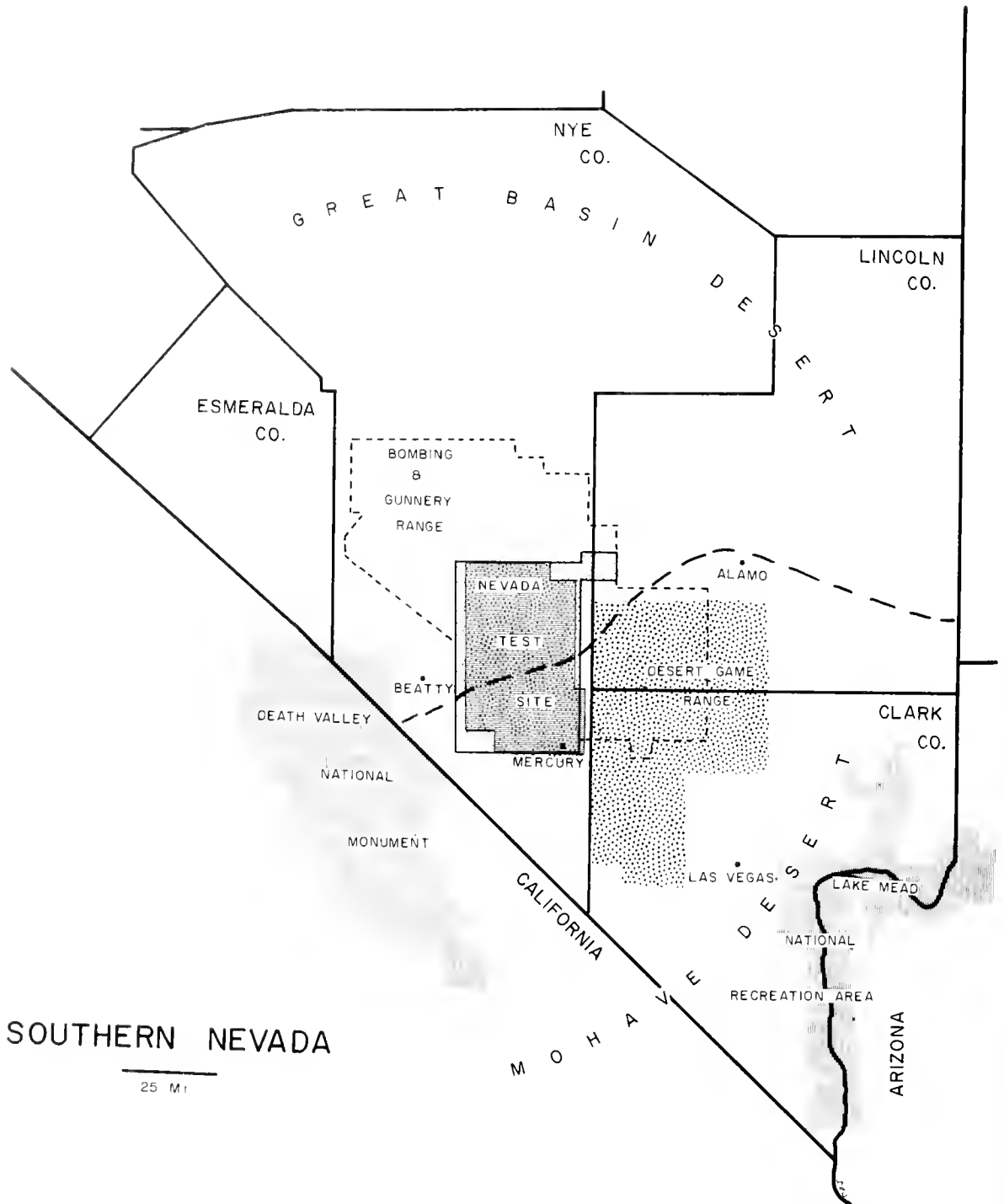


Fig. 1. Location of the Nevada Test Site. Study area is indicated by the lined-stippled area.

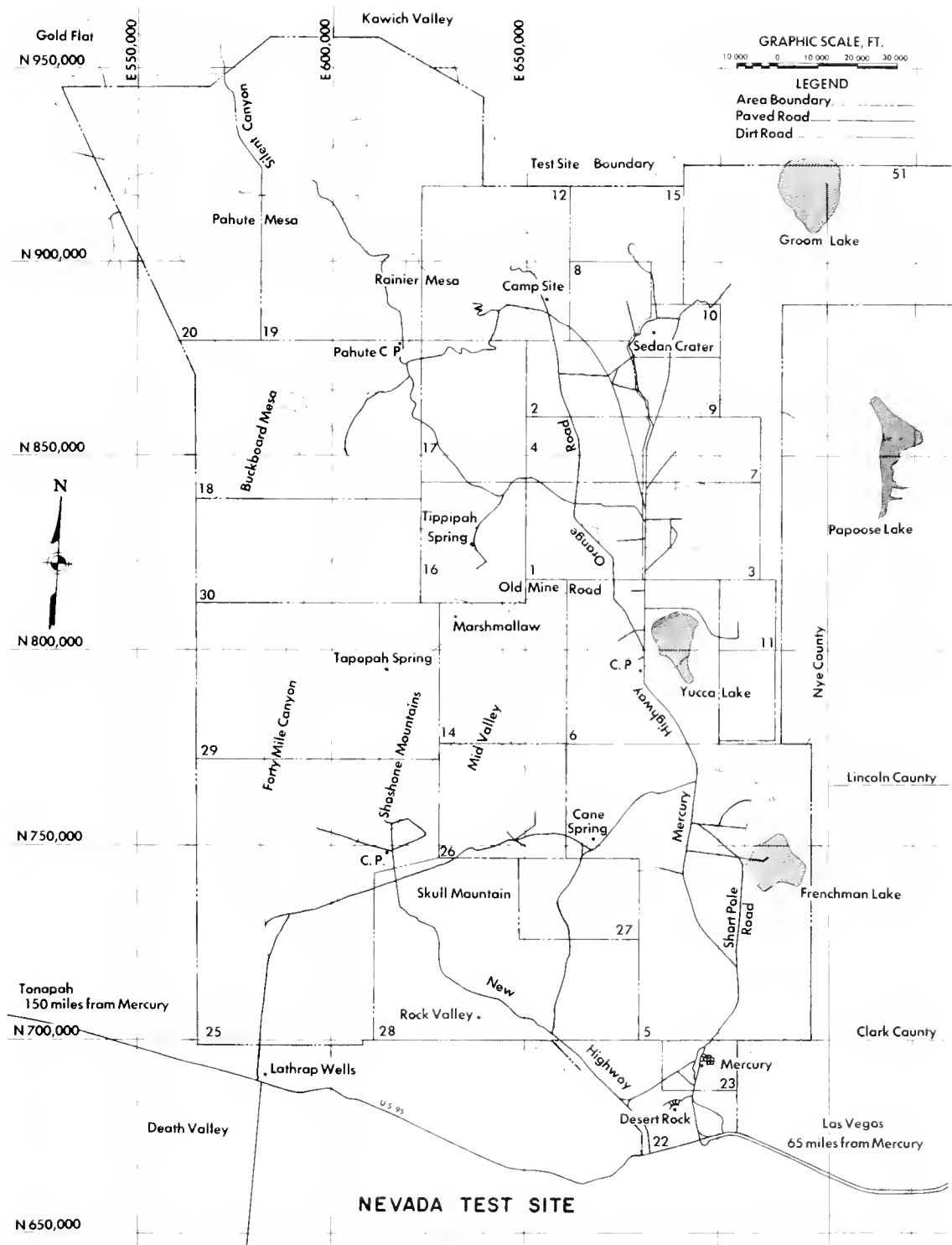


Fig. 2. Major roads, localities, and area divisions of the Nevada Test Site.

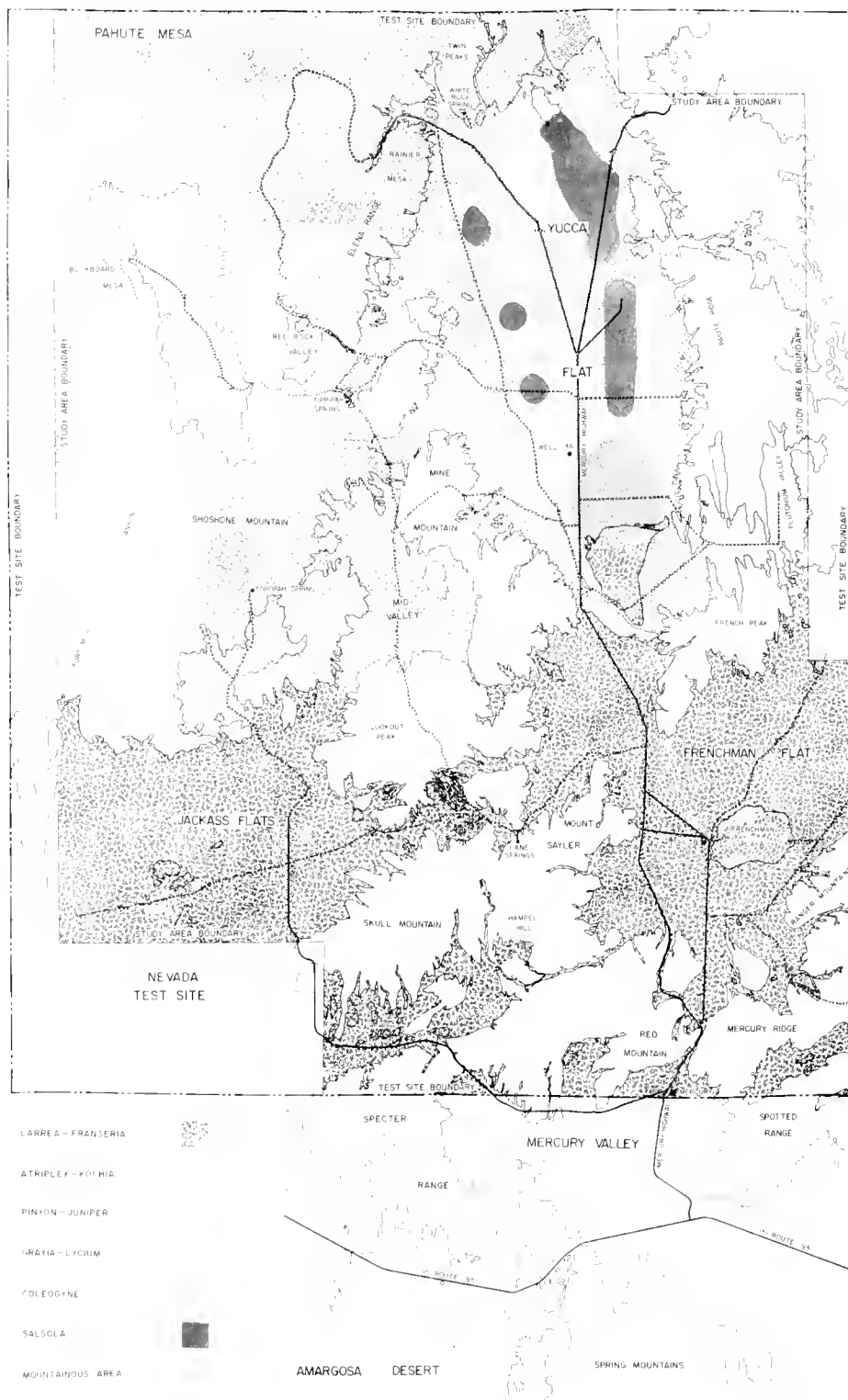


Fig. 3. Extent of the major plant communities at the Nevada Test Site.



Fig. 4. Aerial view showing geographic conformation of part of the Nevada Test Site. The playa in the distance is Frenchman Lake; the valley area around it constitutes Frenchman Flat.



Fig. 5. Aerial view of the south and east sides of Yucca Flat. Individual plants of the Yucca forest may be distinguished in the foreground.

Nuclear Medicine and Radiation Biology, Los Angeles, California.

I wish to thank the authorities of the Illinois Natural History Survey for permission to reproduce many figures used in the publication, "Miridae of Illinois" (Knight, 1941), Bulletin Vol. 22, Art. 1. I have used Figures 22-69 by the

author, and Figures 87, 89-96, 100, 101, 103, 105, 108, 109, 110, 113, 127, 137, 141, 142, 144, 145, 151, 154, 156, 158, 160, 169 and 172 drawn by the artist C. O. Mohr.

The following account and pictures of the physiographic and biotic features of the test site were prepared by Dr. D Elden Beck.

PHYSIOGRAPHIC AND BIOTIC FEATURES

Figure 1 shows the location of the Nevada Test Site with reference to contiguous states and other well-known political subdivisions. The overall size varies from time to time as the needs of the federal government and its several agencies decree. Under any circumstances it amounts to several thousand square miles. For purposes of this report the map as Figure 2 shows the general boundary limits. This study was confined to these boundaries for data gathered at the Nevada Test Site. The Atomic Energy Commission uses the site as a proving ground. The main entry to the site is at Mercury, Nevada, about 70 miles northwest of Las Vegas along Highway US 95, the main route between Las Vegas and Tonopah, Nevada.

There are three rather distinctive physiographic features characteristic of the Nevada Test Site. The eastern third of the area is characterized by closed valleys lying between low, rugged mountains on the east and hills, mountains, and mesas on the west. Two playas, Yucca and Frenchman, are centrally located, with Groom Lake in the northeast corner of the site. Extensive flood plains extend their fan-shaped

deposits where they issue from the mountains and mesas, coursing their way to the closed-in valleys below (Figures 4, 5, 6). Some workers designate these foothill areas as bajadas. At the southwest corner at a point west of Cane Springs, the test site drainage opens to the west with extensive lowlands and bajada contours. The remainder of the site comprises the greatest surface area and is made up of land masses at higher elevations comprised of mountains and mesas of varying proportions. The drainage is to the west, mainly the Forty Mile Canyon. Principal landmarks are the Shoshone Mountains, Buckboard Mesa, Rainier Mesa, Pahute Mesa, and the Elna Range. (See Figures 3 and 4 to better relate the main physiographic features noted above. Other minor physiographic characteristics are also shown.) Spring water is restricted more or less to Cane Springs (Fig. 7), Tippihah Spring (Fig. 8) and White Rock Spring. These are mainly seepage water in origin instead of copious water courses.

With a great variety of physiographic features extant at the test site, plus other factors such as different soil types, elevation, water



Fig. 6. View showing a typical alluvial fan deposit (bajada) which builds up at the junctures of arroyos and canyons with a nearly flat valley. Larger plants in the foreground are *Larrea*.



Fig. 7. Cane Springs area taken from above the springs. Plants in the foreground are *Atriplex* and *Elymus*. Note the fine mixture of plants in the small valley in the background, and the small corral with a foundation of an old building, near which two isolated mesquite trees grow.

Fig. 7. Cane Springs area taken from above the springs. Plants in the foreground are *Atriplex* and *Elymus*. Note the fine mixture of plants in the small valley in the background, and the small corral with a foundation of an old building, near which two isolated mesquite trees grow.



Fig. 8. Terrain near Tippipah Spring, favorable for growth of *Ephedra nevadensis*, a typical plant just in front of the collector, H. H. Knight.

supply and extremes in temperature, a comparable variation in biotic communities may be expected. Allred, Beck and Jorgensen (1963) were unable to apply community classifications such as Life Zones, Biotic Provinces, etc., to fit their needs. What was desired was a workable scheme applicable to smaller biotic communities.

Two major biotic divisions were established—the Desert Scrub (Fig. 9) and the Desert Woodland (Pigmy Forest) (Fig. 10) after the concept of Munz and Keck (1959). The former comprises the vegetative patterns of the lowland basins and foothills (bajadas). The latter constitutes the plant types of the higher elevations, such as mesas and mountains, distinguished in the main by the Pinyon-Juniper forest. These two major divisions were then broken down into smaller vegetative entities designated as communities. The same biotic communities described for studies by Allred *et al.*, (*ibid.*) are applied to the present investigation. (See Fig. 3 for a delineation of these communities.)

Of significant consideration and interest in any application of a biotic community designa-

tion to the Nevada Test Site, is the geographic position of the Great Basin in relationship to the Mohave Desert.

In this respect the basin desert concept as defined by Jaeger (1957) has been used (Fig. 1). The line of demarcation is naturally not as exact as the figure indicates. Actually a great intermixing takes place along this theoretical boundary. The influence of each region is reflected by the complex of plant and animal types which have been previously reported, and as will be noted in this study indicates clearly the occurrence of the Great Basin and Mohavian influence, both north and south and at the region of intermixing.

To one not acquainted with the desert lands of the southwest, on first acquaintance the open spacing between plants is impressive (Fig. 9). This is especially true of the desert lowlands, basins and bajadas, although by degree it is the same at higher elevations in the woodlands (Fig. 10). The shrubby plants comprise the dominant vegetative picture, and the composition has been the derivative for community



Fig. 9. View showing the wide separation of shrub-type plants—*Lycium pallidum* in foreground, with *Larrea divaricata* in the darker background.

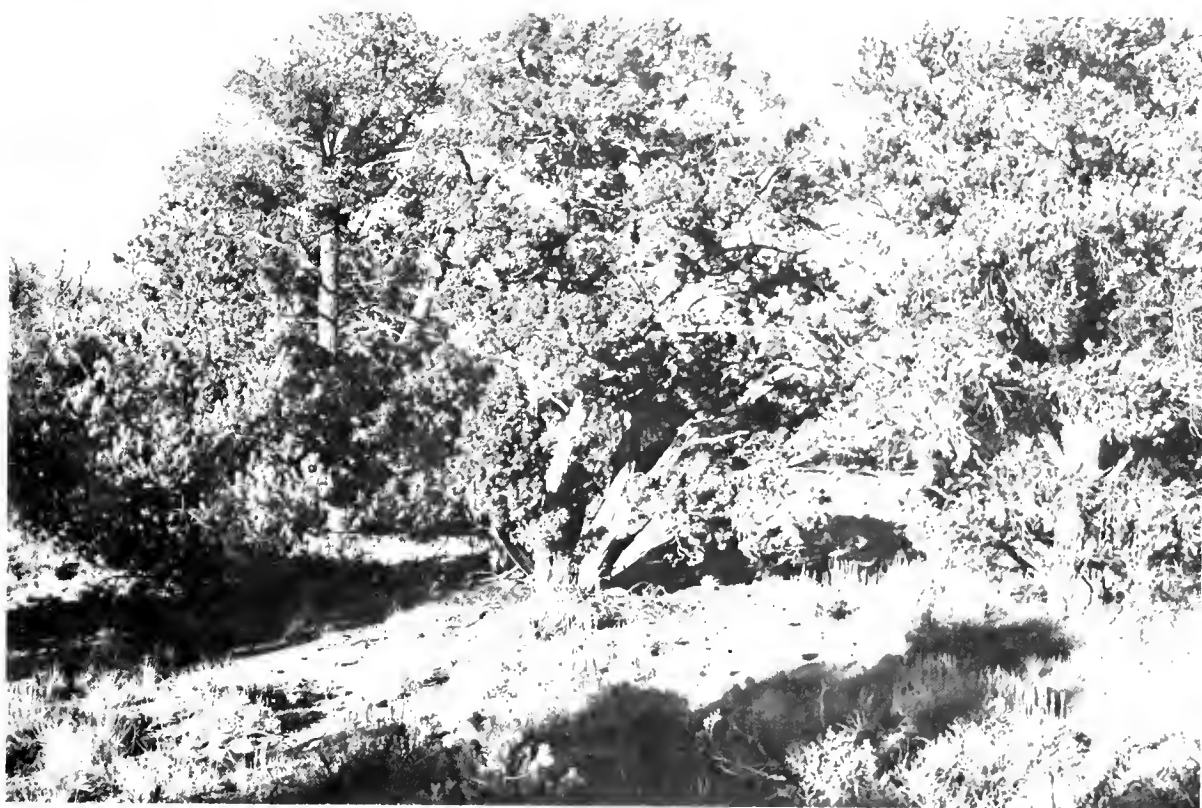


Fig. 10. Pinyon-Juniper forest community, host trees that produced the greatest number of species of Miridae.

designation. For example, the Creosote-Bush, *Larrea divaricata*, and Burr-Sage, *Franseria dumosa*, considered distinctively Mohavian, make up the *Larrea-Franseria* community (Fig. 9). The Desert Woodland at higher elevations is dominated by the Pinyon-Pine, *Pinus monophylla*, and the Juniper, *Juniperus osteosperma*, and is designated the Pinyon-Juniper community (Fig. 10). However, there may be extensive stands of Three-Toothed Sage, *Artemisia tridentata*, and/or Gambell's Oak, *Quercus gambelli*, intermixed or by themselves. Extensive areas of Black-Brush, *Coleogyne ramosissima*, in almost pure stands make up the *Coleogyne* community as a single plant species.

Of special importance in reference to the present study is the understanding of the growth

of annuals. What appears as barren ground in the spaces between plants described above, becomes very much alive with annuals at certain seasons of the year or in successive years depending on climatic factors. The life span is very brief in many instances, and the flowering period may only last a day or so. In this study it was very important to be there at the right time to make collections, for many species of Miridae appear and are gone with the time of flowering and its termination.

With the use of Figure 2 and data referred to under each species discussion in this paper, one should have no difficulty in then turning to Figure 3 and identifying the general plant community in which such a collection or collections were made if obtained at the Nevada Test Site.

EARLY LITERATURE OF WESTERN MIRIDAE

Relatively few workers have paid special attention to collecting Miridae west of Colorado. Some early collecting of insects was done in connection with the federal surveys of the western territories. This material passed through the

hands of Dr. P. R. Uhler, who was the only specialist publishing on Hemiptera from the western states before 1900. Uhler (1872-1877) described many species of Hemiptera, including 30 species of Miridae from the western states.

Uhler (1893) published a paper on Utah Hemiptera, describing nine species of Miridae; and later (1894) described 20 species of Miridae from Southern California and Lower California, most of which are Mohavian in distribution and extend into the Great Basin area. Uhler (1895) described Hemiptera in the "Preliminary List of the Hemiptera of Colorado," including 36 new species of Miridae, several of which range over the Great Basin area. Inasmuch as Uhler did not designate type specimens for the new species, he unwittingly set up road blocks for later workers that have taken years to solve. Reuter (1909) published a large paper on Nearctic Miridae, describing some 55 new species, several from the western United States, but set up a number of problems when he failed to designate types for his new species. Mr. E. P. Van Duzee, collecting mostly in California, published from 1910 to 1925, and described some 193 species of Miridae. All his types are marked properly and are now preserved in the California Academy of Sciences. This was the situation beginners faced when I began working on Miridae in 1914.

Only a few genera have previously been worked out with keys to the species. Van Duzee (1916) published a revision of the genus *Orthotylus* with a key to the species. Knight published a revision of the genera *Lygus* (1917) and of *Deracocoris* (1921), and described species of *Lopidea* in six different papers, providing figures of the male claspers for distinctions. For species in these genera I give data only for those taken at the test site. Carvalho (1957) published a "World Revision" of the genus *Trigonotylus* Fieber, which includes ten species from North America.

Now, after fifty years of recurrent study of North American Miridae, seeking to locate species described by the early workers, I offer my findings with keys to the genera and to species of the large genera that I have assembled for study from the Great Basin and Mohavian areas. Several large genera are revised with keys for the first time. For some genera such as *Lopidea*, *Slaterocoris* and *Hesperocapsus*, I have provided figures of the male claspers, which serve better than written words to distinguish the species.

COLLECTION AND PRESERVATION OF MIRIDAE

The best time to collect Miridae is when the host plants come into bloom. In most cases mirid eggs hatch when a dormant plant starts new growth. The nymphs feed on the unfolding leaves as they grow, pass through five nymphal instars, and become mature about the time the host plant comes into bloom. When we started collecting on June 10, 1965, the plants at lower levels around Mereury were past the peak bloom, the plant bugs were mature and scattered from the host plants. Next day we found flowers in bloom at two or three hundred feet higher elevation above the valley floor around Freneman Flat. Collecting was at a peak around Cane Springs on June 11 and 14. Each day we followed the blooming plants to slightly higher elevations, usually 100 to 200 feet higher each day. On June 24 we had excellent collecting along the road just below the rim of Rainier Mesa, altitude about 7,000 ft. That day we added a dozen species to our list, and I believe that had we been able to continue collecting every day until July 10, we probably could have added some fifty more species to the list.

Because of the fragile nature of the appendages and pubescence of mirids, special attention

must be given to their collection. Insect nets made of fine mesh nylon material, 15 inches in diameter, are best (Fig. 11). Sweeping may be done on grasses and herbaceous plants that bend and give with the stroke of a net, but most shrub type plants of the semiarid regions are so rigid that beating the plants with a club is necessary to dislodge the plant bugs. The net should be held beneath branches or parts of rigid plants, then the plant struck with a two-foot length of broom stick. The insects are jolted into the open net, then captured with cyanide bottles of small diameter, tubes that may be closed temporarily by use of the thumb while other specimens are being cornered for capture. Collecting at night around electric lights or special light traps is very effective, as many species of Miridae are attracted to lights. As a matter of fact, several species have never been collected elsewhere. The so-called "black (ultraviolet) light" was used at the test site with good results.

All Miridae should be mounted on pin points for best preservation and study. The tip of the points should be bent to fit the angle of the thorax so the specimen will set level when



Fig. 11. Close up of an *Ephedra nevadensis* bush, with D Elden Beck (right) talking to H. H. Knight, about species of plant bugs taken on *Ephedra*.

mounted. Only the bent tip of the point should be covered with adhesive. With the specimen resting on its back with legs and antennae extended free from the body, touch the right side of the thorax just above the coxae with the tip of the point to pick up the specimen. Set the pin down on a cork block, then level the specimen with forceps or needle into proper position before the adhesive can set or congeal. When specimens cannot be mounted within 24 hours

after collecting, it is best to place them between layers of cellucotton. I have found that 2-inch square plastic boxes are most convenient to use, for when it comes to mounting, one may introduce three or four drops of water, wait about 30 minutes, and the specimens will be relaxed ready for mounting. If one wishes to transport or ship the layered specimens, he should be sure to use enough cellucotton to prevent their movement.

BIOLOGY

Mirid eggs are elongate, slightly curved or bean-shaped, with a cap or micropyle on the end pointing to the outside of plant substance where embedded. The eggs of most mirids pass the winter or dormant season in the stems of plants, in bark or cambium of trees and shrubs,

or even in dead and decaying stubs and branches where the female bug placed them. Most eggs will hatch when moisture and favorable temperatures return following a dormant period. Most species have a one-year cycle, but a few species are known to have two generations

per year, and in exceptional cases three or four generations have been recorded. When two generations are produced within a year, the host is a plant which produces succulent growth throughout the summer season. Thus, the tiny nymphs find the maximum amount of sap for food which is essential for plant feeders. The nymphs pass through five instars or stages of development, and at the fifth molt attain sexual maturity and, except in special cases where the adults are wingless, a set of wings. The time required for nymphal development varies with different species, but several species are known to take between 18 to 30 days. Beginning with the third nymphal instar the development of wing pads may be observed. During the fourth instar the wing pads are clearly evident, while in the fifth instar the wing pads usually extend to the middle of the abdomen.

During nymphal development many mirid species have been observed to possess the curious habit or ability of protruding a portion of the rectum. When the nymph is dislodged and falls from a branch or leaf to the foliage below, the rectum is protruded, and, being provided with a sticky material, acts as an adhesion disk upon striking the foliage of the limbs below. The nymph then scrambles for a foothold, pulls the adhesion disk free, retracts the rectum, and runs for cover among the leaves. Thus, the ever-visible rectal disk saves many falling nymphs from losing contact with the host plant. The adult females may mate within two or three days after emergence, but do not start laying eggs until a week or ten days later. The males are generally the first to mature, but they do not live as long as the females. When a female is ready to oviposit, she moves up and down the branch of a host plant, patting the surface with antennae and touching the bark here and there with the tip of the rostrum or proboscis. Individual females have been observed to spend from six to ten minutes searching for a suitable spot to oviposit. Having selected a spot, the female begins to drill a hole by means of the proboscis, and this operation may require from five to 18 minutes before the hole is ready for insertion of the ovipositor. After drilling the hole with the beak, the female arches the abdomen, stands as high as possible, then unsheaths the ovipositor and thrusts it forward to locate the place prepared. She turns her head under with the tip of proboscis in the hole to help guide the ovipositor. One female was observed to make seven attempts before inserting the ovipositor. Most individuals make two or three attempts

before succeeding. After each failure the female inspects the hole and works upon it for a short time with her beak. Once insertion of the ovipositor is started, the female works the abdomen up and down with a rapid jerky motion until the ovipositor is inserted to its base. An alternate contraction and expansion of the abdomen then occurs while the egg is being worked down into position. This operation requires about two or three minutes. The female then withdraws the ovipositor and rests four or five minutes before inserting the second egg.

In observations on *Heterocordylus malinus* Reuter, one female was observed to oviposit in six different places within two hours. This same female was observed to oviposit daily from June 23 to 27, but died on June 28. Another mirid, *Taedia pallidulus* (McAtee), was found to lay eggs only where dead wood was available. Females that were caged on limbs free of scars and dead stubs did not oviposit. Four females were observed to lay when placed on branches having dead stubs. Five eggs were placed around the margin of one stub, a new hole being made for each egg.

In the case of *Lygus hesperus* Knight, the species has been found laying eggs from early spring to late September. Sorenson (1939), working in Utah, found that *hesperus* took approximately 46 days for successive broods, and at least three generations were produced in one season. *Halticus bracteatus* (Say) breeds continuously during the warm season, and is credited with five generations per year in South Carolina. *Adelphocoris lineolatus* (Goeze) rears two generations in a season on alfalfa and sweet clover. *Tropidostepes amoenus* (Reuter) rears two generations in one summer on white ash, *Fraxinus americana*. The cotton flea hopper, *Pseudatomoscelis seriatus* (Reut.), breeds continuously on *Croton* spp. and cotton, or as long as the succulent host plants remain green.

HIBERNATION

A majority of mirid species pass the winter in the egg stage. Usually the eggs are embedded in some part of the host plant. Species of *Lopidea*, *Labopidea* and *Adelphocoris* lay eggs in stems or leaves. Mirid eggs have a relatively impervious chorion which permits them to remain viable for several months, although embedded in plant material which is almost completely dessicated. Relatively few species hibernate as adults. *Stenodema vicinum* (Prov.) and *Stenodema trispinosum* Reuter are known to do



Fig. 12. Ecological disturbance resulting from an above-ground atomic detonation. The denuded area is being invaded by *Salsola*, Russian thistle.

so, and no doubt other members of the genus do likewise. Adults of *Lygus hesperus* Kngt., *L. vanduzeei* Kngt., *L. plagiatus* Uhler, *L. pabulinus* (Linn.), *Orthops campestris* (Linn.), and *Agnocoris rubicundus* (Fallen) have all been taken in hibernation. Species of *Deracocoris* (subgenus *Camptobrochis*) hibernate as adults, since *D. nebulosus* (Uhler), *D. piccatus* Kngt., *D. histrio* Reut., and *D. nubilus* Kngt. have frequently been taken in winter hibernation. Here again, hibernation appears to be a group characteristic. *Dicyphus vestitus* Uhler and *D. discrepans* Kngt. have also been taken in hibernation.

FEEDING HABITS

Probably a majority of the species of Miridae are plant feeders, but a large number are now known to be chiefly predaceous. In the genus *Deraeocoris* several species are known to be chiefly predaceous, feeding primarily on aphids, but small nymphs of the same species and occasionally large nymphs have been observed sucking sap. Members of the subfamily

Cylapinae are predaceous or mycetophagous, namely, species of *Fulvius*, *Peritropis* and *Cylapus*. Known species of these genera are normally found hiding in crevices around dead trees, stumps and logs.

In the large genus *Phytocoris*, several species are known to be predaceous, particularly the dark-colored, bark inhabiting species. Fulton (1918) demonstrated that *Philophorus perplexus* D. & S. feeds freely on apple aphids, three nymphs having reduced a colony of 50 aphids to six within two days.

HOST RELATIONSHIPS

Among the plant feeders, apparently the greater number of species are limited to a single host, or to a genus of plants, while a very few, such as *Lygus oblineatus* (Say) and *Halticus bractcatus* (Say), have a wide range of food plants. Even among species which always breed on a single host plant, a general dispersal of individuals usually takes place. Following the



Fig. 13. A badly damaged Yucca plant at the periphery of an atomic blast. It is coming back to life and showing new growth.

time of emergence and mating, individual females of *Lygus*, *Lopidea* and *Tropidosteptes* have been found scattering to various plants near the host where they developed; thence, they doubtless become dispersed over a wider territory and to new plants, although in the normal course of their lives, at least a few eventually return to suitable growth of the preferred host plant for the purpose of oviposition. Some individuals may be carried by the wind for miles, then a few individuals may settle by chance near the preferred host where they are attracted to lay eggs and start a colony of bugs far from the starting point. It seems most likely that this is the way that isolated host plants become colonized by species which require that particular host. This appears to be the most likely way that female specimens of *Phymatopsallus prosopidis* and *Microphylidea prosopidis*, both known to breed only on mesquite (*Prosopis juliflora*), reached two isolated mesquite trees at Cane Springs at the test site. I also note that *Microphylidea prosopidis* was taken on mesquite at St. George, Utah, along with *Neurocolpus arizonae* Kngt. and *Phytocoris brevis-*

culus Reut., but the latter two species were not present on the mesquite trees at Cane Springs.

It appears that some kinds of plants are more favorable for mirid species than others. More species of Miridae were found on *Pinus monophylla* than any other, namely:

Platylygus vanduzeei Usinger
Largidea nevadensis, n. sp.
Dichroosecytus pinicola, n. sp.
Phytocoris mellarius Kngt.
Phytocoris tricinipes, n. sp.
Dichaetocoris nevadensis, n. sp.
Dichaetocoris merinoi, n. sp.
Dichaetocoris pinicola, n. sp.
Pilophorus microsetosus, n. sp.
Philophorus merinoi, n. sp.
Lepidopsallus pini, n. sp.
Lopidea scutata Kngt.

It is very unusual to find three species of one genus on the same host plant.

The next host in number of mirid species is *Juniperus osteosperma* with the following species:

Bolteria speciosa Van D.

Bolteria juniperi, n. sp.
Dichrooscytus apicalis, n. sp.
Dichrooscytus junipericola, n. sp.
Dichrooscytus flavivenosus, n. sp.
Dichaetocoris juniperi, n. sp.
Parthenicus tenuis, n. sp.
Phytocoris juniperanus, n. sp.

Another interesting plant is *Ephedra nevadensis* (Fig. 11) which is host for the following species of Miridae:

Ankylotylus pallipes, n. gen., n. sp.
Merinocapsus ephedrae, n. gen., n. sp.
Phytocoris ephedrae Kngt.
Phytocoris becki, n. sp.
Phytocoris pulchricollis Van D.

Lopidea becki, n. sp.

Lopidea deserta, n. sp., which was also taken in numbers on four other host plants.

Other hosts that produced several species of Miridae are the genera *Artemisia*, *Chrysothamnus* and *Atriplex*. The number of species associated with these plants may be found in the list of host plants at the end of this bulletin. It will be noted that most shrub-type plants usually serve as hosts for two or more species of Miridae, but one exception is *Colcogyne ramosissima* Torr. This plant is a dominant shrub, often growing in nearly pure stands on the upper bajadas, but we were unable to find any mirid upon it.

TAXONOMY

The Miridae are distinguished by four-segmented antennae; a four-segmented rostrum of which the first segment is as long as or longer than the head; three-segmented tarsi (except *Peritropis* in which they are two-segmented); wing membrane with only two cells or areoles, one longitudinal vein (anal vein), a well-developed cuneus on the wing, and by absence of ocelli (Fig. 14). The four-segmented antennae are usually slender, nearly linear, or the second segment only slightly thickened apically, but in a few genera strongly thickened as in *Capsus*, *Atractotomus*, *Beamerebella*, *Larinocerus* and *Teleorhinus*; third and fourth segments usually slender but in some genera distinctly thickened as in the *Ceratocapsini*.

The hemelytra are typically separated into clavus, corium, cuneus and membrane, the embolium usually not clearly separated from the corium; veins of membrane forming two cells, a small and larger areole; however, in a number of species the hemelytra may be abbreviated (brachypterous), the membrane almost absent or reduced to a narrow band with veins poorly indicated. Modifications of the arolia, the pulvillae-like structures between the tarsal claws, furnish the most reliable characters for separating the subfamilies.

In general, the Miridae are small to medium in size, from 2.0 to 9.5 mm in length, usually rather fragile, broader than high and longer than broad; as viewed from above, ovate to oblong, but in a few genera rather slender as in *Trigonotylus*. The male is usually more slender

than the female. The body is variously clothed with fine hairs or pubescence, sometimes modified to form sericeous or scalelike hairs which are easily shed, and intermixed with simple hairs and bristles. Frequently the dorsum is practically glabrous and strongly shining.

The numerous species exhibit the greatest variety of color patterns, ranging from the most obscure to forms that are vivid red. Color varieties within the species are frequent, and the two sexes are more often differently colored, the male usually darker colored than the female. Brachypterous and apterous forms occur throughout the family, and individuals of a single species may exhibit variation in this respect, the female more often modified than the male; good examples are *Miris dolabratus* (Linnaeus), *Stittocapsus franseriae* Knight, and species of *Hesperocapsus* and *Ceratocapsus*. Usually the male is macropterous even when the female is apterous, but in rare cases the male may be apterous also.

Ant-mimic forms are rather numerous among the Miridae, especially in species of *Coquillettia*, *Sericophanes* and *Pilophorus*. In such forms the abdomen is constricted at the base while the head and thorax are so modified that the resemblance to ants is unmistakable. The species of *Sericophanes* and *Coquillettia* are generally found upon the ground running about among ants, but the biological relationship, if any, has not been determined. In Iowa I found *Sericophanes heidemanni* Poppius rather abundant on the ground among short grasses and weeds

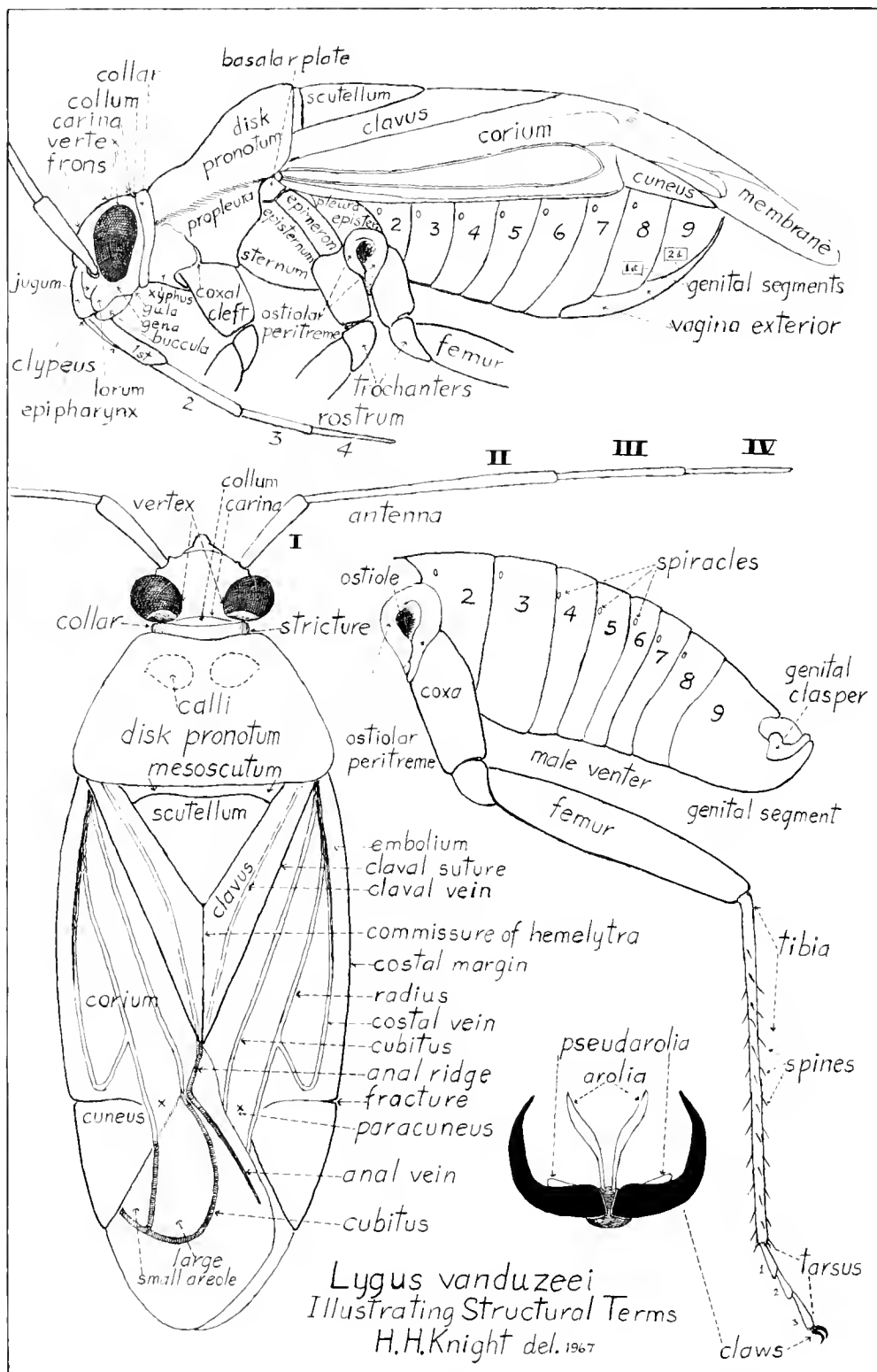


Fig. 14. *Lygus vanduzeei*, showing typical mirid structures and illustrating structural terms.

of closely cropped pasture land, the bugs were running about where the little brown ants, *Lasius niger alienus* var. *americanus* Emory, were very abundant. At Fort Snelling, Minnesota, in an area of little disturbed, high prairie vegetation, particularly among the shorter grasses, I found and collected a large series of *Coquillettia amocna* (Uhler) from an area which abounded with the ant, *Formica* (*Ncoformica*) *pallide-fulva* var. *incerta* Emory. The wingless females so resemble this ant in form and color that one must look rather closely or with a lens to separate them. Miridae of the above species of *Sericophanes* and *Coquillettia* are extremely agile and very rapid of movement, especially when they happen to meet face to face with ants. While they seem not to fear the ants, they appear to avoid close contact with them.

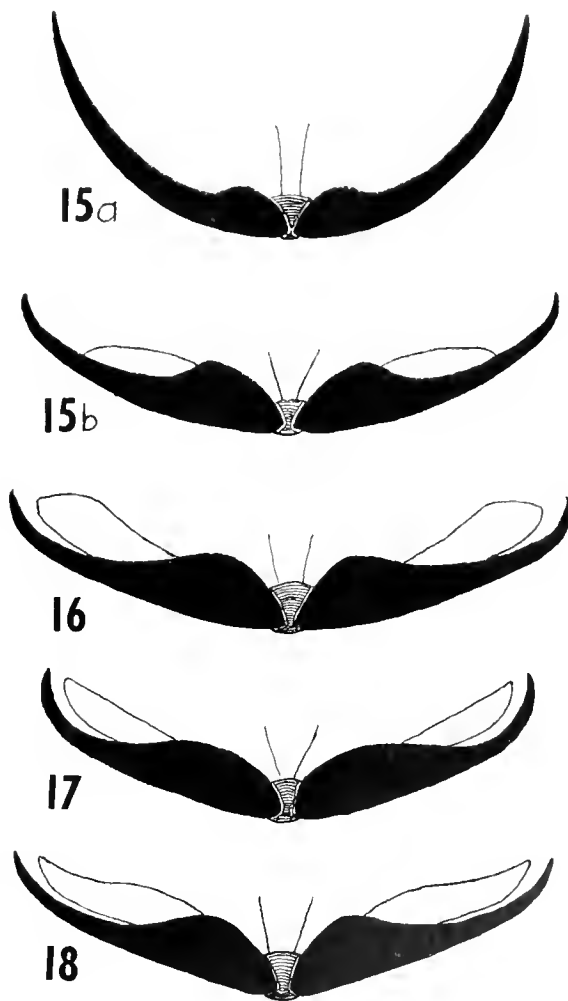
SYSTEMATIC CHARACTERS

The most important character for separation of subfamilies is found in the structure of the arolia, situated between and at the base of the claws (Fig. 14). In the subfamilies Phylinae and Deraeocorinae the arolia are represented by a pair of erect bristles that are difficult to see in the smaller species. The arolia are erect and well developed in the Orthotylinae and Mirinae—they converge at the tips in Orthotylinae, and diverge apically in the Mirinae. Pseudarolia are clear to white in color and occur on the inner curvature of the claw near the base. The pseudarolia are found in the Phylinae, but are larger and more prominent in the Dicyphinae and Bryocorinae.

The form of the male genital segment is rather distinctive in the subfamily Phylinae. The genital claspers are relatively small, with the tip of the right clasper resting in a notch across the middle of the V-shaped left clasper; both oedagus and claspers are twisted somewhat to the left side. I believe that this particular form of genital segment is a fundamental character of the Phylinae. In other subfamilies the male genital segment often presents good characters for the separation of genera as well as species. Specific differences are more likely to be found in the male claspers, which are asymmetrical in form and differ among the species in many genera. It is fortunate that in several of the largest genera, the numerous species may be identified by the form of the genital claspers, as in *Phytocoris*, *Lopidea*, *Orthotylus*, *Cetracapsus* and *Deraeocoris*. Additional structures which are distinctive for separating species are

tergal processes as found in *Hesperocapsus* and *McLanotrichus*. On the other hand, in several sizeable genera such as *Taedia*, *Neurocolpus* and *Tropidosteptes*, the male genital claspers appear to be of little value for distinguishing species. Fortunately, in *Taedia* and *Neurocolpus* the length of antennal segments and form of the pubescence offer very good characters for separating species.

Among the Miridae, pubescence often provides useful characters. It varies from simple, fine hairs—erect, recumbent or appressed—to silky, slightly curled pubescence, or even flattened, scalelike hairs. The scalelike pubescence found on several species of *Phytocoris*, and the genera *Dichaetocoris* and *Squamocoris*, is easily



Figs. 15-18. Claws. 15a, *Atomoscelis modestus*; 15b, *Microphylidea prosopidis*; 16, *Beckocoris laticephalus*; 17, *Nevadocoris becki*; 18, *N. bullata*.



Figs. 19-22. Claws. 19, *Brachyceratocoris nevadensis*; 20, *Closterocoris amoenus*; 21, *Cyphopelta modesta*; 22, *Stittocapsus franseriae*.

shed or lost; hence, specimens should be collected and preserved with great care.

In a number of genera, particularly the subfamily Phylinae, the form and occurrence of the pubescence may be used to separate genera as well as species. This is also true among the Orthotylinae, as found in the large genus *Parthenicus*, where small size is the rule; many species may be keyed by the type, presence or absence, and color of pubescence. The male claspers in *Parthenicus* are also distinctive of species, but due to small size it is often more convenient to use characters of the pubescence for making separations.

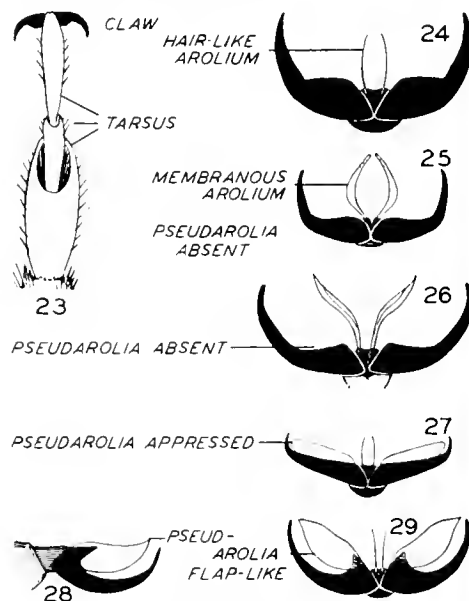
The shape of the head and thorax is much used for generic characters, and minor differences may indicate species. The length of the rostrum may be of generic value, but more fre-

quently it differs among the species and may form good distinctions, as in *Polymerus* and *Lygus*. The antennae are generally linear in form with the last two segments very slender. However, some genera may be separated by the exceptional form of the different segments; the second segment is strongly thickened in *Capsus*, *Atractotomus*, *Larinocoris* and *Teleorhinus*; the third and fourth segments are usually slender, but in the *Ceratocapsini*, they are equal in thickness to the second segment.

TARSAL CLAWS AND AROLIA

The student wishing to identify Miridae must acquaint himself with the structure of tarsal claws and arolia. These characters are used in identifying most of our forms to subfamily and sometimes to genus. It is highly desirable that the student examine a selection of different kinds of mirids to acquaint himself with the various conditions of the arolia and pseud-arolia on the tarsal claws. The claws are best examined at high magnifications against a dark background. If possible, examine them with high-power magnifications of the stereoscopic binocular microscope.

The tarsal claws are situated at the extreme end of the third tarsal segment (Fig. 23). The simplest type is shown in Figure 24, which has a pair of hairlike arolia arising from the area



Figs. 23-29. Tarsal claws and arolia. 23, *Monalocoris americanus* Wag. & Slater; 24, *Largidea davisi* Kngt.; 25, *Diaphnocoris pellucidus* (Uhl.); 26, *Pithanus maercklii* (H. S.); 27, *Teleorhinus tephrosicola* Kngt.; 28, 29, *Dicyphus rubi*.

between the base of the claws. In some groups these arolia are membranous and thickened; in such cases, they are either convergent at apex (Fig. 25) or divergent at apex (Fig. 26). These two membranous types are generally readily visible without any doubt as to their structure. In other groups there are cushionlike or flap-like membranous areas called pseudarolia attached to the claw itself.

Pseudarolia may be very small; they may be present in instances where the arolia are either hairlike or membranous. Among the species in which the arolia are hairlike, the pseudarolia are often large. Figure 27 shows an example in which the pseudarolia are large and joined to the claw from base to near apex; Figures 28

and 29 illustrate an example in which the pseudarolia are flaplike and attached to the claw at its base. In some genera the claws are without trace of pseudarolia (Figs. 24-26), while the true arolia are erect and distinct.

DEPOSITORIES OF TYPE MATERIAL

The holotypes of the new species described in this publication will be deposited in the U.S. National Museum. Paratypes and other determined material will be found in the collections of Harry H. Knight, Brigham Young University, Iowa State University, California Academy of Sciences Museum, Texas A & M University, and Dr. J. C. Schaffner.

TREATMENT OF THE SPECIES

Key to the Subfamilies

1. Arolia absent, or present but bristle-like in form (Figs. 30-53) 2
 Arolia present, erect and prominent; arising from between bases of claws (Figs. 54-67) 7
2. Prothorax simple, destitute of an apical stricture, sometimes with a flattened apical area suggesting a collar, but not separated off by a distinct incised line; male genital segment distinctive, the tip of the aedeagus, or flagellum, twisted to the left, lying closely within the bend of left clasper, the tip extending downward and beyond PHYLINAE, p. 23
 Prothorax provided with an apical stricture, sometimes fine and shallow; when apparent only at the sides, an impressed line extends back to the rear of calli; male genitalia not as the above 3
3. Claws thick, either sharply bent (Fig. 32), or broadly curved (Figs. 49-53), or sharply curved and cleft near base (Figs. 33-37) 4
 Claws simple and slender, rarely widely spread (Figs. 30-31); tibiae weakly spinose, long and tapering apically, or greatly shortened; in the latter case segment I of the tarsi unusually long, the head transverse and eyes strongly protruding CYLAPINAE, p. 15
4. Pseudarolia well developed (Figs. 49-53) 5
 Pseudarolia absent (Figs. 24, 32-37) 6
5. Ultimate tarsal segment incrassate, always thicker than the preceding segment; pseudarolia broadly involving the claws (Figs. 49-50); tibiae destitute of spines; lora confluent with genae BRYOCORINAE, p. 76
 Ultimate tarsal segment linear; basal angle of claw acute, pseudarolia more slenderly attached (Fig. 51-63); lora usually distinctly separated from the genae DICYPHINAE, p. 67
6. Pronotum narrowed to a distinctly necklike anterior portion; head narrowed posteriorly, appearing stalked; claws sharply bent on basal half, forming a

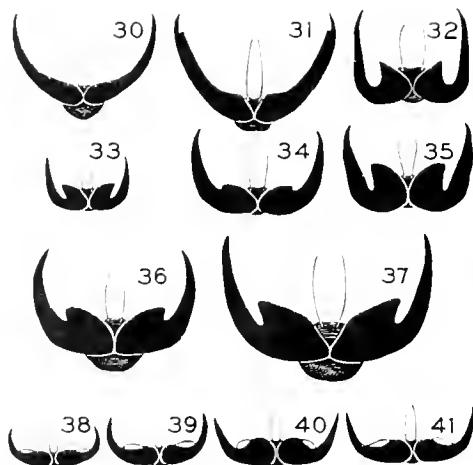


Fig. 30.—*Fulvius brunneus*.
 Fig. 31.—*Cylapus tenuicornis*.
 Fig. 32.—*Hyaliodes vitripennis*.
 Fig. 33.—*Deraeocoris nebulosus*.
 Fig. 34.—*Deraeocoris pinicola*.
 Fig. 35.—*Deraeocoris ruber*.
 Fig. 36.—*Eurychilopteryella luridula*.
 Fig. 37.—*Eustictus venatorius*.
 Fig. 38.—*Microphylellus modestus*.
 Fig. 39.—*Psallus ancorifer*.
 Fig. 40.—*Rhinocapsus vanduzeei*.
 Fig. 41.—*Criocoris saliens*.

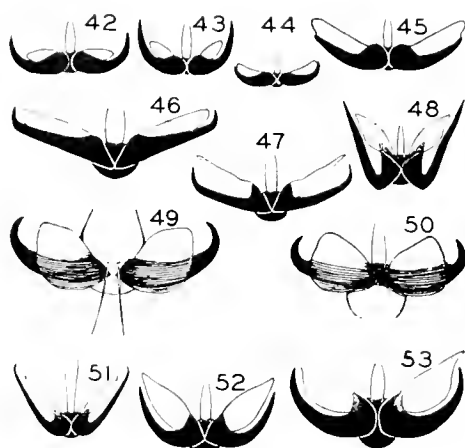


Fig. 42.—*Microsynamma bohemanii*.
 Fig. 43.—*Reuteroscopus ornatus*.
 Fig. 44.—*Chlamydatus associatus*.
 Fig. 45.—*Lopus decolor*.
 Fig. 46.—*Orectoderus obliquus*.
 Fig. 47.—*Coquillettia mimetica*.
 Fig. 48.—*Dicyphus famelicus*.
 Fig. 49.—*Pycnoderes dilatatus*.
 Fig. 50.—*Sixeonotus insignis*.
 Fig. 51.—*Dicyphus discrepans*.
 Fig. 52.—*Macrotylus sexguttatus*.
 Fig. 53.—*Macrolophus separatus*.

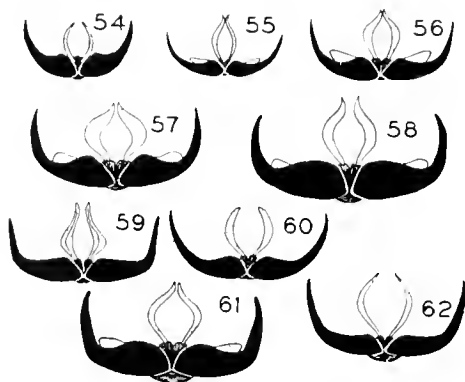


Fig. 54.—*Parthenicus vaccini*.
 Fig. 55.—*Halticus bracteatus*.
 Fig. 56.—*Halticus intermedius*.
 Fig. 57.—*Strongylocoris stygius*.
 Fig. 58.—*Heterocordylus malinus*.
 Fig. 59.—*Ceratocapsus modestus*.
 Fig. 60.—*Labops hirtus*.

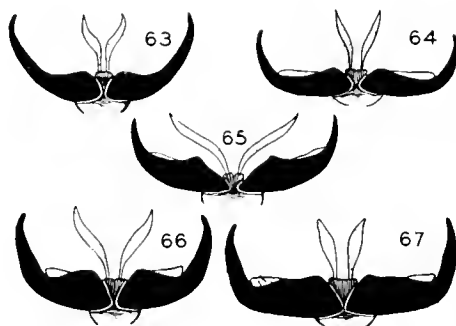


Fig. 61.—*Unacora malina*.
 Fig. 62.—*Orthotylus flavosparvus*.
 Fig. 63.—*Stenodema trispinosum*.
 Fig. 64.—*Phytocoris lasiocornis*.
 Fig. 65.—*Barberiella apicalis*.
 Fig. 66.—*Lygus vanduzeei*.
 Fig. 67.—*Platytyellus insitivus*.

- prominent tooth on inner angle of base (Fig. 32); hemelytra strongly translucent, embolium expanded, usually with thin sharp edgeHYALIODINAE, p. 79
- Pronotum not greatly narrowed, head not stalked; claws usually cleft near base, but not bent as in Fig. 32; embolium not expanded to form a thin, sharp edge DERAEOCORINAE, p. 79
7. Arolia converging on apical half (Figs. 54-62) ORTHOTYLINAE, p. 87
- Arolia diverging on apical half (Figs. 63-67) MIRINAE, p. 176

Subfamily PHYLINAE

Key to the Genera

1. Pronotum nearly subtriangular, or lateral margins sulcate, with a somewhat flattened apical collar, the collar not elevated or set off from disk of pronotum by a deep constriction; abdomen more or less constricted at base 2
- Pronotum relatively wider, without a flattened apical collar; abdomen never constricted at base 4
2. Second antennal segment strongly clavate, its thickness on apical half more than twice that of segment I; rostrum reaching near base of hind coxae; hemelytra developed in both sexes *Teleorhinus* Uhler, p. 64
- Second antennal segment linear, or thickened on apical half, but thickness not over twice the thickness of segment I; rostrum reaching only to middle coxae; female brachypterous or wingless 3
3. Second antennal segment linear; pseudarolia attached at base of claw, free apically (Fig. 47); females wingless *Coquillettia* Uhler, p. 62
- Second antennal segment thickened on apical half (Fig. 80); pseudarolia completely joined to claw (Fig. 46); females brachypterous*Orectoderus* Uhler, p. 64
4. Pseudarolia large, attached only at basal angles and extending free and parallel with claw to apex (Fig. 52) 5
- Pseudarolia shorter, minute or wanting (Figs. 38-43) 8
5. Clypeus prominent, projecting anteriorly; head and pronotum clothed with bristles and hairs 6
- Clypeus curving ventrad; head and pronotum without strong bristles 7
6. Second antennal segment short, length subequal to width of head; segment II stout, thicker than segment I *Brachyceratocoris*, n. gen., p. 61
- Second antennal segment longer, length exceeding width of head; segment II slender, thickness not equal to segment I *Macrotylus* Fieb, p. 62
7. Dorsal surface, legs and antennae sprinkled with numerous black spots *Oncotylus* Fieb, p. 59
- Dorsal surface, legs and antennae unspotted; color pallid, legs uniformly yellowish*Nevadocoris*, n. gen., p. 59

8. Antennal segments II and III, strongly inflated, bearing several erect, flat black, scalelike hairs 9
 Antennal segment III not inflated, segments without black, scalelike hairs 10
9. Head with clypeus and sides of face shining black, giving the impression of wearing a black mask; antennal segment IV inflated *Beamerella* Kngt., p. 58
 Head not shining black on clypeus and sides of face; antennal segment IV tapering, not inflated *Larinocerus* Frsch., p. 58
10. Head very wide, width equal to or slightly greater than width of pronotum at base; rostrum reaching beyond posterior coxae *Beckocoris*, n. gen., p. 35
 Head width not equal to basal width of pronotum 11
11. Clypeus sharply produced, apex acute *Criocoris* Fieb., p. 35
 Clypeus not sharply produced on apex 12
12. Species bearing a single type of hair or pubescence 26
 Species bearing two types of pubescence, simple hairs intermixed with sericeous, woolly, or scalelike pubescence 13
13. Antennal segment II clavate or subclavate 14
 Antennal segment II more slender, not or little thicker than segment I 15
14. Head subconical in shape, vertex and frons convex, vertex margin higher than dorsal margin of the eyes; antennal segment I thickened, about equal to the clavate segment II *Ranzovius* Dist., p. 35
 Head not subconical, antennal segment II clavate, thicker than segment I *Atractotomus* Fieb., p. 56
15. Space between buccula and lower margin of eye very narrow, scarcely wider than thickness of antennal segment I: small species, length under 3.0 mm *Rhinacloa* Reut., p. 35
 Space between buccula and lower margin of eye distinctly greater than thickness of segment I 16
16. Tibial spines with a black spot at base, or spines and tibiae uniformly black; or black forms with white, scalelike hairs 19
 Tibial spines without black spot at base; but no black forms with white, flat, scalelike hairs 17
17. Head inclined forward, clypeus not sharply bent; pseudarolia attached only at base, tip free and extending slightly beyond middle of claw (Fig.) *Reuteroscopus* Kirk., p. 55
 Head more vertical; pseudarolia small, inconspicuous, not extending beyond middle of claw 18
18. Clypeus sharply bent, curved ventrad at middle, apex pointing distad; tibial spines pallid to yellowish, femora never black *Ankylotylus*, n. gen., p. 55
 Clypeus curved but not sharply bent; femora and tibial spines black, in males shaded with fuscous but cuneus reddish *Merinocapsus*, n. gen., p. 34

19. Wing membrane markings conspurcate; male genital segment with a tubercle on left side; small species, length 3.2 mm or less <i>Phymatopsallus</i> Kngt., p. 49	
Wing membrane not conspurcate unless rostrum reaches middle of venter	20
20. Femora and tibiae with large brownish black spots; clypeus prominent; head and pronotum with long, erect, strong bristles; sexes dimorphic, female abdomen very broad, subtriangular, brachypterous .. <i>Hoplomachidea</i> Reut., p. 34	
Without large leg spots; sexes not dimorphic	21
21. Claws broadly curved, pseudarolia absent, or very small	22
Claws more sharply curved, pseudarolia present	23
22. Head vertical, clypeus not visible from above, its apex directly beneath position of antennal fossa; rostrum not surpassing hind coxae; size small, not over 3.0 mm	<i>Atomoscelis</i> Reut., p. 26
Head inclined forward, apex of clypeus in front of a vertical line passing through antennal fossa; rostrum usually extending beyond hind coxae <i>Megalopsallus</i> Kngt., p. 26	
23. Second antennal segment with distinct black spots; with silvery sericeous pubescence on hemelytra grouped into small spots, arising from black dots on the cuticula	<i>Pseudatomoscelis</i> Popp., p. 55
Second antennal segment without black spots; the sericeous pubescence not grouped into spots	24
24. Head broad, position vertical, clypeus not visible from above; width of vertex equal to or greater than half the width of head	<i>Europiella</i> Reut., p. 37
Head not so broad, inclined forward, clypeus visible from above; width of vertex not equal to half the width of head, but if so, then the clypeus is visible from above	25
25. Length of second antennal segment greater than width of head across eyes; or with sericeous pubescence, but not with wide flat scales <i>Psallus</i> Fieb., p. 47	
Length of second antennal segment not greater than width of head across eyes; or head and pronotum with appressed, flat, scalelike hairs <i>Lepidopsallus</i> Kngt., p. 51	
26(12). Length of second antennal segment less than, or not exceeding width of head across eyes	27
Length of second antennal segment greater than width of head	30
27. Femora light colored, marked with conspicuous black spots on ventral surface <i>Campylomma</i> Reut., p. 28	
Femora dark, or entirely light, but without dark spots	28
28. Hemelytra black, with a transverse light mark extending across middle of clavus; male antennae with first and second segments greatly thickened <i>Spanagonicus</i> Berg, p. 31	

- Hemelytra uniformly colored, never with contrasting pale mark extending across clavus; male antennae slender, scarcely thicker than in female 29
29. Tibiae punctate, or tibial spines black *Chlamydatus* Curt., p. 27
 Tibiae pallid, impunctate, tibial spines pallid *Microphylidea*, n. gen., p. 29
30. Tibiae with a dark spot at base of spines (punctate), sometimes only on basal half of posterior tibiae 31
 Tibiae impunctate, without dark spots at base of spines *Microphylellus* Reut., p. 30
31. Head and pronotum set with erect, black bristles 33
 Head and pronotum clothed with recumbent hairs or pubescence, without erect bristles 32
32. Margin of compound eye well separated from antennal fossa by a space equal to thickness of second antennal segment at base; margin of eye near antennal fossa almost straight *Monosynamma* Scott, p. 31
 Margin of compound eye almost touching antennal fossa, space between the two somewhat less than diameter of second antennal segment at base *Plagiognathus* Fieb., p. 30
33. Head vertical in position, base of clypeus not visible as viewed from above *Phyllopidea* Kngt., p. 31
 Head more inclined forward, clypeus visible from above 34
34. Bristles on the dorsum with black spot at base of each; rostrum not reaching hind coxae (American species) *Hoplomachus* Fieb., p. 33
 Bristles on dorsum without black spot at base; rostrum reaching the hind coxae or beyond *Chaetophylidea*, n. gen., p. 33

Genus *Atomoscelis* Reuter

Atomoscelis modestus (Van Duzee)

Fig. 15a

Tuponia modestus Van Duzee, 1914:30.

Atomoscelis modestus Van Duzee, 1917:414, cat.

Atomoscelis modestus Knight, 1927:35, hosts.

This species is known from California, Arizona, Utah, Idaho, Washington, Colorado, South Dakota, Oklahoma, Texas, and New Mexico. The species was found breeding on *Iva xanthifolia* in Colorado; also collected on *Chenopodium* in Arizona. Record for Nevada: ♂ July 21, 1965, Area 5M, Nevada Test Site (J. M. Merino), taken at laboratory lights.

Genus *Megalopsallus* Knight

Megalopsallus nuperus (Van Duzee)

Oncotylus nuperus Van Duzee, 1923:157.

Described from San Francisco Island, Gulf

of California, where Van Duzee found the species breeding on *Salicornia*.

Megalopsallus latifrons Knight

Megalopsallus latifrons Knight, 1927:226.

Allied to *nuperus* (Van D.) but differs in the relatively shorter second antennal segment; and femora with fuscous dots. Described from Colorado. New records: ♂ 2 ♀ July 8, 1930; ♂ 5 ♀ July 15, 1929, Richfield (E. W. Davis); 3 ♂ 4 ♀ July 26, 1949, Bear River Refuge, Utah (G. Ruhr).

Megalopsallus rubropictipes Knight

Megalopsallus rubropictipes Knight, 1927: 225.

Described from Colorado. New records: ♂ May 1, 1930; 2 ♂ July 8, 4 ♂ Aug. 15, 1929, Richfield, Utah (E. W. Davis), taken in light trap. 3 ♂ 16 ♀ July 12, 1965, Elko, Nevada (H. H. Knight), taken by beating *Atriplex*.

Megalopsallus marmoratus, new species

Differs from all known species of the genus by having the wing membrane marmorate with fuscous; legs strongly marked and spotted with red.

Male. Length 2.7 mm, width 1.10 mm. Head: width .74 mm, vertex .36 mm; yellowish, spots on vertex, dots on median line of frons, and sutures of the face, red. Rostrum, length 1.2 mm, pale yellowish, apex blackish, reaching to near base of genital segment. Antennae: segment I, length .17 mm, yellowish, red beneath; II, .78 mm, brownish yellow, with recumbent pale pubescence, and a few erect longer hairs; III, .61 mm, dusky yellow; IV, .40 mm, dusky. Pronotum, length .37 mm, width at base .90 mm, pale yellow, calli fuscous brown, disk with several dots of brownish and red. Scutellum and mesocutum pale yellowish, flecked with red. Dorsal surface clothed with recumbent, simple pale hairs and intermixed with appressed silvery and golden sericeous pubescence. Hemelytra pale or pallid, dotted with brown, apical area of corium may be shaded with dusky

brown, cuneus dusky. Membrane pale to milky white, shaded and marked with numerous fuscous or brown dots and spots, producing a marmorate effect. Ventral surface pallid to reddish brown, mesosternum dark reddish brown. Legs pallid, femora dotted and marked with reddish brown, hind femora reddish brown on anterior aspect, paler on apex, front and middle femora strongly marked with large and small reddish dots; tibiae pallid, with reddish brown dots at base of spines. Venter pallid, shaded and marked with reddish flecks.

Female. Length 2.4 mm, width 1.2 mm. Head: width .78 mm, vertex .41 mm. Rostrum reaching to near middle of ovipositor. Antennae: segment I, length .17 mm; II, .72 mm, cylindrical; III, .54 mm; IV, .37 mm. Pronotum, length .40 mm, width at base .95 mm. Color and pubescence very similar to male.

Holotype: ♂ May 5, 1942, Yuma, Arizona (L. L. Stitt). **Allotype:** ♀ taken with the type. **Paratypes:** 3♂ 3♀ and nymphs taken with the types. ♂ April 17, 1939, Yuma County, Arizona (L. L. Stitt), taken at light.

Genus *Chlamydatus* Curtis

Key to the Species

1. Femora black, apices may be pallid 2
 Front and middle femora pallid or yellow; all tibiae pale to yellowish, tibial spines black, but without a black spot at base of spines *associatus* Uhler
2. Tibiae pallid to yellowish 3
 Tibiae fuscous to black 4
3. Tibial spines black, also with a large black spot at base of each; second antennal segment pallid, narrowly fuscous at base; rostrum reaching only to tips of middle coxae *monilipes* Van D.
 Tibial spines black but without black spots at base; rostrum reaching upon posterior trochanters *suavis* Reuter
4. Length of second antennal segment slightly exceeding width of vertex plus dorsal width of an eye; pubescence short, dark brown to golden brown in color; embolar margin nearly straight; vertex impressed, nearly flat, surface granulated *uniformis* Uhler
 Length of second antennal segment scarcely equal to width of vertex plus dorsal width of an eye; pubescence longer, pallid to silvery in color; embolar margin distinctly arcuate; vertex convex on middle, smooth *becki*, n. sp.

Chlamydatus associatus (Uhler)

Fig. 44

Agalliastes associatus Uhler, 1872:419.*Chlamydatus associatus* Atkinson, 1890:173.*Chlamydatus associatus* Knight, 1941:25.

The following records are for the Nevada Test Site: Area 17M, ♂ 2 ♀ July 29, 1965, on *Malacothrix glabrata*; 15 ♂ ♀ July 27, 59 ♂ ♀ Aug. 26, 1965, on *Franseria acanthicarpa*; 2 ♂ Aug. 30, 1965, on *Malacothrix glabrata*; Area 19M, ♂ ♀ Aug. 30, 1965, on *Viguiera multiflora*.

This species has a wide distribution, probably occurs in every state, and is known from California to Maine. At the test site most specimens were taken on *Franseria acanthicarpa*, but in the eastern states it commonly breeds on ragweeds, *Ambrosia*.

Chlamydatus monilipes Van Duzee*Chlamydatus monilipes* Van Duzee, 1921:132.

This species was described from Santiago Co., California; more recently found at Mohave, Calif. Specimens collected at the test site are as follows: Area 6M, 3 ♂ ♀ June 15, 1965; Area 17M, ♂ June 11, 1965; Area 18M, 3 ♂ 2 ♀; Area 19M, 52 ♂ ♀ June 23, 1965, taken on *Tetradymia*; Area 501M, 3 ♂ ♀ June 14, 1965; Area TM, 2 ♂ June 14, 1965.

Chlamydatus suavis Reuter*Agalliastes suavis* Reuter, 1876:92.*Chlamydatus suavis* Uhler, 1886:21.*Chlamydatus suavis* Knight, 1941:26.

This species is known from southern California, Arizona and Utah, and most likely will be found at the test site when more collecting is done.

Chlamydatus uniformis (Uhler)*Agalliastes uniformis* Uhler, 1893:379.*Chlamydatus uniformis* Van Duzee, 1917:417.

This species was described from American Fork, Utah, and more recently collected from Juab County, Utah. It may eventually be found in southern Nevada, as is true of most species indigenous to the Great Basin.

Chlamydatus becki, new species

Allied to *uniformis* Uhler, and distinguished as indicated in the key; pubescence pale to sil-

very; length of second antennal segment scarcely equal to width of vertex plus dorsal width of one eye.

Male. Length 2.2 mm, width 1.0 mm. Head: width .64 mm, vertex .34 mm; moderately convex, smooth, black. Antennae: segment I, length .17 mm, black; II, .44 mm, cylindrical, black; III, .30 mm, fuscous; IV, .24 mm, fuscous. Rostrum, length .78 mm, reaching upon posterior trochanters, black. Pronotum, length .37 mm, width at base .81 mm; black. Dorsal surface clothed with simple, recumbent, pale to silvery pubescence, in some angles of light one may glimpse yellow hairs. Scutellum, mesonotum, and hemelytra black, moderately shining, clothed with recumbent, moderately long, pale to silvery pubescence. Embolar margin moderately arcuate. Membrane and veins uniformly shaded light fuscous. Ventral surface and legs uniformly black, tibiae and spines black.

Female. Length 2.2 mm, width 1.12 mm. Head: width .71 mm, vertex .36 mm; black, vertex moderately convex, smooth. Antennae: segment I, length .16 mm, black; II, .44 mm, cylindrical, slightly more slender near base, black, apex more fuscous; III, .27 mm, fuscous; IV, .20 mm, fuscous. Pronotum, length .40 mm, width at base .85 mm. Embolar margin distinctly more arcuate, but coloration and pubescence very similar to the male.

Holotype: ♂ June 28, 1965, American Fork, Utah (H. H. Knight). **Allotype:** ♀ same data as the type. **Paratypes:** 8 ♂ 8 ♀ taken with the types by beating and sweeping on *Artemisia tridentata*. ♂ 2 ♀ June 29, 1965, Scipio, Utah (H. H. Knight). Specimens collected at the Nevada Test Site: Area 6M, 2 ♂ June 17, 1965; Area 401M, 3 ♂ June 19, 1965 (H. H. Knight & J. M. Merino).

The species is named for Dr. D Elden Beck, who made it possible for us to collect and study these plant bugs.

Genus *Campylomma* Reuter*Campylomma verbasci* (Meyer)

Fig. 68

Capsus verbasci Meyer, 1843:70, Pl. 4, Fig. 1.*Campylomma verbasci* Knight, 1941:25, Fig. 87.

Known from British Columbia, Oregon, Washington, Idaho, Colorado and states eastward. Breeds commonly on *Verbascum*.

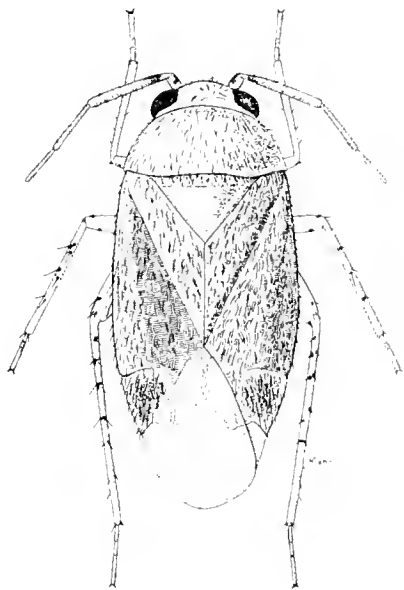


Fig. 68. *Campylomma verbasci*, ♂.

Microphylidea, new genus

Runs in the generic key to the couplet with *Chlamydatus*, where the length of second antennal segment does not exceed width of head. Tibiae and femora without spots or marks of any kind. Arolia are bristlelike; pseudarolia of medium size, attached to claw for their full length (Fig. 15b), characters that place this genus in subfamily Phylinae. Head inclined forward about as in *Microphyllellus*, but second antennal segment shorter, length not exceeding width of head. Rostrum rather short, not reaching beyond middle coxae. Pubescence consists only of short, simple pubescent hairs. Antennae rather short, segment II cylindrical, in the male thicker than segment I; female antennae more slender, apex of segment II about equal in thickness to segment I. Genital segment and claspers rather similar to *Plagiognathus* in general form. Type of the genus: *Microphylidea prosopidis*, new species.

Microphylidea prosopidis, new species

Fig. 15b

Distinguished by the small size, also with second antennal segment just equal to width of head; uniformly pale yellow in color, without dots or spots of any kind.

Male. Length 2.9 mm, width 1.1 mm. Head: width .72 mm, vertex .27 mm. Antennae: segment I, length .17 mm; II, .72 mm, cylindrical, thickness .10 mm, slightly thicker than segment I (.07 mm), micropubescent, yellowish, apex

fuscous; III, .30 mm; IV, .17 mm, pallid. Rostrum, length .78 mm, just reaching upon base of middle coxae, pale yellowish, apex fuscous. Pronotum, length .47 mm, width at base .98 mm; disk moderately convex, calli indistinct, basal edge marked by a slightly impressed line. Mesoscutum yellowish, scutellum more pallid. Hemelytra subtranslucent, embolar margin nearly straight; membrane nearly clear, veins pallid to white. Dorsal surface clothed with short, simple, pale to yellowish pubescence. Ventral surface pallid to yellowish, sides of venter greenish, genital segment more yellowish. Legs pallid to pale yellowish; tibial spines yellowish, without dark spot at base.

Female. Length 2.9 mm, width 1.2 mm. Head: width .68 mm, vertex .30 mm. Antennae: segment I, length .17 mm; II, .64 mm, subcylindrical, slightly more slender near base, thickness at apex just equal to segment I, yellowish, not fuscous on apex; III, .30 mm; IV, .24 mm, yellowish. Rostrum just reaching to middle of intermediate coxae. Pronotum, length .49 mm, width at base 1.05 mm. Slightly more robust than the male but similar in color and pubescence.

Holotype: ♂ June 13, 1965, Area CM, Nevada Test Site (D. E. Beck and H. H. Knight). **Allotype:** ♀ same data as the type. **Paratypes:** 74 ♂ ♀ taken with the types on *Prosopis juliflora*, which is the host plant of the species. Collected from two trees which grow near old abandoned water troughs at Cane Springs. Botanists say these two trees are all they have found at the test site and state these trees were "probably planted. Apparently not reproducing." The trees were in bloom, with catkins full of pollen when the bugs were collected; the bugs were difficult to see among the pollen yellow catkins. These two isolated trees stand some 20 miles north of known natural stands of mesquite, are the hosts for two species of Miridae, the above new species, and *Phymatopsallus prosopidis* described elsewhere. **Additional specimens:** 3 ♂ 9 ♀ April 28, 1939, Yuma County, Arizona (L. L. Stitt), swept from *Prosopis*. 15 ♀ June 30, 1965, St. George, Utah (H. H. Knight), taken on *Prosopis juliflora*.

Microphylidea pallens, new species

Distinguished from *prosopidis* by the longer second antennal segment which is subequal to width of head; also differs in the longer, simple pubescence.

Male. Length 2.9 mm, width 1.2 mm. Head: width .68 mm, vertex .38 mm; nearly vertical

in position. Antennae: segment I, length .17 mm, pale yellowish; II, .68 mm, cylindrical, slightly more slender near base, thickness on apical half just equal to segment I, pallid; III, missing. Rostrum, length .98 mm, reaching upon apices of hind coxae. Pronotum, length .44 mm, width at base .98 mm, pallid plus a tint of green; disk and the whole dorsum clothed with suberect, rather long pale hairs, length of longest hairs nearly equal to dorsal width of an eye. Dorsal surface rather uniformly pallid plus a tint of green. Hemelytra subtranslucent, lateral margins nearly parallel, but embolar margins forming a perceptible arcuate line. Membrane and veins uniformly pale dusky. Ventral surface and legs uniformly pallid, tibial spines fairly long, pale to yellowish, without spots at base. Genital segment and claspers rather inconspicuous, their form about as in *prosopidis*; claspers and tip of flagellum fuscous.

Holotype: ♂ June 23, 1965, Area 19M, Nevada Test Site (H. H. Knight & J. M. Merino). Only this single male was collected, and being so small and inconspicuous, its distinctive character was not noticed until it was viewed under a binocular microscope.

Genus *Microphylellus* Reuter

Microphylellus symphoricarpi, new species

Distinguished from known species by the red-orange color of antennae and legs; hemelytra and body dusky orange color.

Male. Length 4.1 mm, width 1.5 mm. Head: width .72 mm, vertex .34 mm; yellowish orange. Antennae: segment I, length .20 mm, red orange, fuscous on base; II, .88, red orange, cylindrical, thickness equal to segment I, clothed with short pale pubescence; III, .54 mm, fuscous; IV, .28 mm, fuscous. Rostrum, length 1.18 mm, reaching to apex of middle coxae, or middle of hind coxae, apex fuscous. Pronotum, length .58 mm, width at base 1.18 mm. Dorsal surface rather uniformly pale dusky orange, cuneus more reddish orange, corium subtranslucent; clothed with recumbent to suberect, simple pale pubescence. Membrane uniformly pale fuscous, veins pale orange. Body beneath dusky orange, mesosternum more fuscous. Legs uniformly red orange, no spots evident, tibial spines black, without spots at base; claws and apical tarsal segment black. Genital segment typical of the genus, claspers small and inconspicuous.

Female. Length 3.3 mm, width 1.4 mm. Head: width .73 mm, vertex .34 mm. Antennae:

segment I, length .20 mm; II, .78 mm, cylindrical, thickness slightly less than segment I; III, .47 mm, fuscous; IV, .30 mm, fuscous. Pronotum, length .54, width at base 1.15 mm. Slightly more robust than the male but pubescence and coloration very similar.

Holotype: ♂ June 16, 1965, Area 17M, Nevada Test Site (H. H. Knight & Joe M. Merino). **Allotype:** ♀ taken with the type. **Paratypes:** 4♂ 4♀ and nymphs taken with the types on *Symphoricarpos longifloris* which is the host plant of the species. 3♂ and nymphs June 17, taken on the same host at the type locality, Area 17M.

Genus *Plagiognathus* Fieber

Plagiognathus salviae, new species

Suggestive of *guttatipes* Uhler in the pallid color and black pubescence, but distinguished by the short second antennal segment which in length is subequal to width of head.

Male. Length 3.6 mm, width 1.4 mm. Head: width .68 mm, vertex .31 mm; pallid above, black below base of clypeus and lower margin of eye. Antennae: segment I, length .20 mm, black, narrow apex pale; II, .68 mm, black, with fine pale pubescence; III, .40 mm, black; IV, .23 mm, black. Rostrum, length 2.6 mm, black, pallid on middle, reaching upon posterior trochanters. Pronotum, length .50 mm, width at base 1.10 mm, pallid. Dorsal surface uniformly pallid, clothed with recumbent to suberect fuscous pubescence; hemelytra subtranslucent, each pubescent hair with a minute white speck at base in the hypodermis. Membrane pale fuscous, veins white. Sternum fuscous, sides paler. Legs pallid, apical half of hind femora with row of four fuscous dots on anterior face, and one slightly larger dot just beneath; tibiae pallid, spines and spot at base black, knees with a large black spot; tarsi pale, apical segment and claws black. Venter fuscous to blackish, lateral margins paler; genital segment black, apical one-third pale, claspers and tip of flagellum black.

Female: Length 3.1 mm, width 1.3 mm. Head: width .68 mm, vertex .34 mm. Antennae: segment I, length .20 mm; II, .68 mm, cylindrical, slightly more slender near base, black, middle to most of apical half pallid, apex more or less fuscous; III, .34 mm, fuscous; IV, .24 mm, fuscous. Pronotum, length .51 mm, width at base 1.10 mm. Dark specimens have fuscous on disk of cuneus. Hind femora with row of

five black dots and a second row of four small dots just beneath on apical anterior aspect. Otherwise, color and pubescence similar to the male.

Holotype: ♂ June 22, 1965, Area 19M, Nevada Test Site (H. H. Knight & J. M. Merino).

Allotype: ♀ taken with the type. **Paratypes:** 8♂ 6♀ and nymphs June 22, Area 19M, taken with the types on *Salvia dorrii* which is the host plant of the species. Area 12M: 46 ♂ ♀ June 11, 1965; Area 401M: 4♂ 3♀ and nymphs June 18, 1965, Nevada Test Site (D. E. Beck, H. H. Knight & J. M. Merino), all taken on *Salvia dorrii*, host plant of the species.

Genus *Monosynamma* Scott

Monosynamma bohemani (Fallen)

Phytocoris bohemani Fallen, 1829:106.

Microsynamma bohemani Knight, 1941:24, 42.

Monosynamma bohemani Carvalho, 1958:74, cat.

Known from British Columbia, Washington, Oregon, Colorado, Iowa, Illinois, New York, New England states and Europe. Host plants are *Salix*.

Genus *Spanagonicus* Berg

Spanagonicus albofasciatus (Reuter)

Fig. 69

Leucopocila albofasciatus Reuter, 1907:24.

Leucopocila albofasciatus Knight, 1941: 50, Fig. 92.

Spanagonicus albofasciatus Carvalho, 1958:142.

The following material has been identified from the test site: Area CT, ♂ June 20, 1965; Area M, ♂ June 17, 1965; Area M, ♀ Aug. 4, 1965, at black light; Area M, ♂ Aug. 15, ♂ Aug. 24, 1965, at incandescent light; Area 12M,

♂ Aug. 13, 1965, on *Artemisia tridentata*; Area 16M, ♂ Aug. 19, 1965, on *Franseria acanthi-carpa*.

This species is known from Florida to California, and northward as far as Missouri and New Jersey. It is known to be injurious to grasses on golf greens in the eastern states. The few specimens taken at the test site were not enough to indicate a host plant.

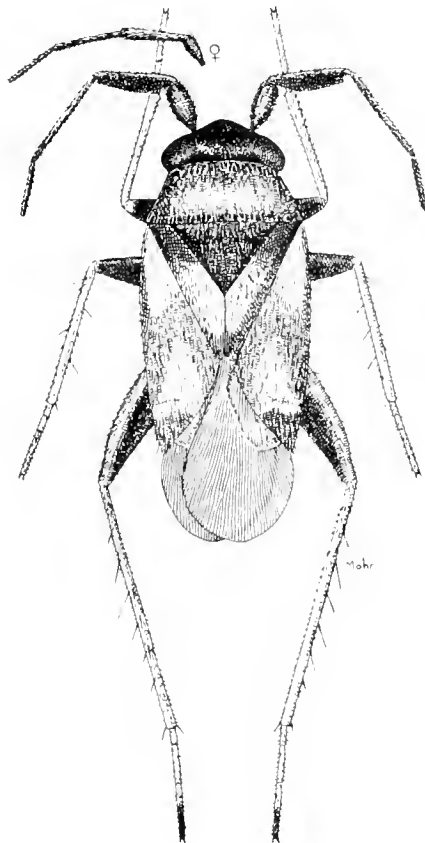


Fig. 69. *Spanagonicus albofasciatus*, ♂.

Genus *Phyllopidea* Knight

Key to the Species

- | | |
|--|---------------------|
| 1. Female specimens | 2 |
| Male specimens | 5 |
| 2. Length of second antennal segment less than width of head | 3 |
| Length of second antennal segment equal to or slightly greater than width of head | 4 |
| 3. Length of second antennal segment shorter than width of head, lacking half the dorsal width of an eye | <i>picta</i> Uhler |
| Length of second antennal segment only equal to width of vertex plus dorsal width of one eye | <i>hirta</i> Van D. |

4. Length of second antennal segment subequal or slightly greater than width of head *utahensis*, n. sp.
 Length of second antennal segment distinctly greater than width of head *montana*, n. sp.
5. Length of second antennal segment not exceeding width of head 6
 Length of second antennal segment greater than width of head 7
6. Length of second antennal segment only slightly less than width of head; head black, pale only on vertex *hirta* Van D.
 Length of second antennal segment clearly less than width of head; head pallid, basal spot and margins of clypeus, lora, and a rather broad arcuate patch each side of frons, black *picta* Uhler
7. Length of second antennal segment only slightly exceeding width of head *utahensis*, n. sp.
 Length of second antennal segment exceeding width of head, plus dorsal width of an eye *montana*, n. sp.

Phyllopidea picta (Uhler)

Bolteria picta Uhler, 1893: 373.

Phyllopidea picta Knight, 1920:127.

Identified specimens of this species from the test site are as follows: Area 16M ♀ June 24, 1965; Area 17M, ♀ June 11, 1965; Area 19M, 5 ♀ June 22, 31 ♂ ♀ June 23, 1965; Area 401M, 4 ♀ June 18, ♂ ♀ June 22, 1965.

This species was originally described from American Fork, Utah, and since has been taken at other points in the state. Collected chiefly on *Artemisia tridentata* which appears to be the favorite host plant.

Phyllopidea hirta (Van Duzee)

Bolteria picta var. *hirta* Van Duzee, 1916:244.

Phyllopidea hirta Knight, 1920:127.

The following records are known from the test site: Area 17M, 6 ♂ ♀ June 11, 1965; Area 19M, 26 ♂ ♀ June 22, 11 ♂ ♀ June 23, 1965; Area 401M, ♂ ♀ June 19, 1965.

Phyllopidea utahensis, new species

Allied to *picta* (Uhler) but differs in the longer second antennal segment, as shown in the key to species.

Male: Length 3.9 mm, width 1.5 mm. Head: width .96 mm, vertex .51 mm; pallid, a small spot each side of vertex, a rather broad arcuate patch each side of frons, joined above, black; lora and ventral half of gena, clypeus except for

pale median line, black. Rostrum, length 1.0 mm, reaching to near apices of middle coxae, brownish black. Antennae, segment I, length .30 mm, black, narrow apex pale; II, 1.05 mm, cylindrical, clothed with short fuscous and black pubescence, thickness equal to segment I, black; III, .61 mm, black; IV, .34 mm. Pronotum, length .60 mm, width at base 1.3 mm, yellowish white, calli covered by a transverse black band that covers space between callosities; propleura black, ventral and dorsal margins pallid. Scutellum and mesonotum white, basal angles and narrow base black. Clavus white, edges of commissure and narrowly bordering scutellum, black. Corium black, a longitudinal stripe that covers radial vein and extends across inner basal angle of cuneus, and margin bordering claval suture, white; embolium and margins of cuneus white. Membrane fuscous, veins white.

Dorsal surface clothed with suberect to erect, almost bristlelike black pubescent hairs; hairs longer and more erect on margins of pronotum and the head. Sternum and sides of thorax black; ostiolar peritreme, margins of epimeron, and spot on episternum, white. Legs pallid, coxae except apices and the bases of femora fuscous; hind femora with row of four or five rather large, subdorsal fuscous spots on anterior face, also a row along median line, that may fuse to form a median fuscous line; all femora with a group of fuscous dots on apical half of posterior aspect. Tibiae pallid, spines and small spot at base of each, black; tarsi and claws fuscous to black. Venter, genital segment and

claspers black; pubescence recumbent, rather short, brownish.

Female. Length 3.8 mm, width 1.6 mm. Head: width 1.0 mm, vertex .58 mm. Antennae: segment I, length .30 mm, fuscous to black, apex pale; II, .30 mm, cylindrical, slightly thicker on apical half but thickness less than segment I, black; III, .68 mm, black; IV, .34 mm, black. Rostrum, length 1.1 mm, black, just reaching upon basal half of middle coxae. More robust, embolar margins moderately arcuate, but color and pubescence very similar to the male.

Holotype: ♂ June 29, 1965, Scipio, Utah (H. H. Knight). **Allotype:** ♀ collected with the type. **Paratypes:** 11♂ 4♀ taken with the types on *Chrysothamnus*.

Phyllopidea montana, new species

Larger and more elongate than *picta* (Uhler), best distinguished by the longer antennal segments, length of segment II equal to width of head plus dorsal width of an eye.

Male. Length 4.7 mm, width 1.6 mm. Head: width 1.04 mm, vertex .57 mm; creamy white, a triangular dot each side of vertex, joining up with a broad band each side of frons, clypeus, lora, and ventral half of juga, black. Rostrum, length 1.19 mm, reaching to middle of intermediate coxae, black. Antennae: segment I, length .30 mm, black, narrow apex pale; II, 1.36 mm, cylindrical, black, thickness slightly less than segment I, black, thickly clothed with short brownish pubescence; III, .98 mm, calli black; IV, .47 mm, black. Pronotum, length .64 mm, width at base 1.3 mm; calli black, dark color projecting slightly posteriorly at lateral margins of calli; propleura white, upper half with black ray that tapers to posterior margin. Scutellum with basal angles black. Hemelytra pallid, semi-translucent; narrow inner margins of clavus fuscous; corium with a longitudinal black stripe just inside of radial vein, a nearly obsolete fuscous mark at outer apical angle; cuneus sub-translucent, discal area with oval black spot. Membrane fuscous, central area darker, veins white. Dorsal surface provided with suberect to erect black pubescent hairs, more erect on head, margins of pronotum and the embolium. Sternum black, each side with a white area, ostiolar peritreme, and margins of pleura white. Venter, genital segment and claspers black.

Female. Length 4.5 mm, width 1.8 mm. Head: width 1.1 mm, vertex .62 mm; black marks as in the male. Rostrum, length 1.2 mm,

reaching upon basal half of middle coxae, black. Antennae: segment I, length .31 mm, black, apex narrowly pale; II, 1.15 mm, slightly thicker on apical half but scarcely equal to thickness of segment I, black; III, .92 mm, black; IV, .43 mm, black. Pronotum, length .64 mm, width at base 1.30 mm. Slightly more robust than the male, but color and pubescence very similar.

Holotype: ♂ July 11, 1964, alt. 6,700 ft, Steamboat Springs, Colorado (H. H. Knight). **Allotype:** ♀ same data as the type. **Paratypes:** 8♂ 4♀ collected with the types on *Artemisia*. ♂ ♀ July 12, ♂ ♀ July 15, 7♂ 3♀ July 16, alt. 7,000 ft, Steamboat Springs, Colorado (H. H. Knight), collected on *Artemisia tridentata*. ♂ June 24, 1937, Soda Springs, Idaho (C. Wake-land). 2♂ 7♀ Aug. 8, 1927, Yellowstone Nat. Park (H. H. Knight); 2♂, Lower Geyser Basin, Yellowstone Nat. Park, Wyoming (V. M. Tanner).

Genus *Hoplomachus* Fieber

Hoplomachus affiguratus Uhler

Hoplomachus affiguratus Uhler, 1895:50, n. sp.

Distinguished by the short rostrum which reaches only upon middle coxae. Dorsal surface pallid to dusky, clothed with erect black bristles, each with fuscous spot at base; hemelytra subtranslucent. Length 4.6-5.0 mm.

Known from Colorado, Wyoming, Idaho, California, Washington and Alberta.

Chaetophylidea, new genus

Head and antennae nearly as in *Plagiognathus*, but differs in having head, pronotum, and elsewhere with bristle type hairs; bristles without fuscous spot at base. Differs from *Hoplomachus* Fieber in having second antennal segment longer and distinctly more slender than segment I; rostrum reaching upon hind coxae, or slightly beyond. Differs from *Phyllopidea* Kngt. in having the head more inclined forward, with clypeus visible from above. Male genital segment, claws and pseudarolia very similar to *Plagiognathus*, but differs in having erect bristles on head and pronotum. Type of the genus: *Plagiognathus moerens* Reuter (1909).

Chaetophylidea moerens (Reuter)

Plagiognathus moerens Reuter, 1909:80.

Hoplomachus moerens Carvalho, 1958:51.

Distinguished from related forms in the generic description. Color pattern fuscous to

black with paler areas, suggestive of *Plagiognathus geranii* Kngt. with which it has been confused in the past. Second antennal segment thicker in the male, thickness about equal to that of front tibia; in the female more slender. Rostrum long, reaching slightly beyond posterior trochanters. Bristles of the dorsum without fuscous dots at base such as found in *Hoplomachus*. Length 4.6-5.0 mm.

Described from Claremont, California. Additional specimens are from Lake County, Kern County, Los Angeles County and Santa Catalina Island.

Merinocapsus, new genus

Head nearly vertical, vertex with ridge or low carina at base. Arolia bristlelike, pseudarolia small, not extending beyond middle of claw. Male genital segment rather small, pointed, left clasper formed for reception of flagellum which points to the left side; general form of segment rather similar to *Psallus* which places the genus in subfamily Phylinae. Pubescence of two types, simple suberect hairs and sparsely intermixed with more appressed, sericeous hairs. Tibial spines black, without black spots at base of spines. Type of the genus: *Merinocapsus ephedrae*, new species.

This genus is named in honor of Mr. Joe M. Merino, who contributed so much to the collection of Miridae for the present study.

Merinocapsus ephedrae, new species

Distinguished by the color combination, black with hemelytra and tibiae red orange; males with more black, the orange hemelytra shaded with fuscous.

Male. Length 3.7 mm, width 1.3 mm. Head: width .88, vertex .42 mm; black, subvertical in position, base of vertex elevated somewhat by a low or blunt carina. Antennae: segment I, length .21 mm, black; II, 1.1 mm, cylindrical, thickness nearly equal to segment I, brownish black, with fine short yellowish pubescence; III, .64 mm, black; IV, .37 mm, black. Rostrum, length .95 mm, reaching to apex of middle coxae, black. Pronotum, length .52 mm, width at base 1.1 mm; black, basal margin of calli outlined by an impressed line, lateral margins of disk slightly concave. Scutellum and mesonotum black. Dorsal surface clothed with suberect, simple, orange and black hairs, intermixed with more appressed, silvery and golden sericeous pubescence. Hemelytra reddish orange, cuneus

deeper red, in darker specimens the orange color shaded with fuscous; embolar margins slightly sinuate, although nearly parallel; membrane and veins shaded with fuscous, veins with orange color. Ventral surface and legs black; tibiae orange color, more or less darkened with fuscous; spines black but without black spot at base. Genital segment tapered to narrow on apical half, flagellum curved downward to left side, resting upon left clasper.

Female. Length 3.3 mm, width 1.2 mm. Head: width .88 mm, vertex .44 mm; black, vertex and frons bearing appressed, silvery sericeous pubescence. Antennae: segment I, length .18 mm, black; II, .92 mm, cylindrical, slender, thickness only half that of segment I, clothed with fuscous and black pubescent hairs, reddish orange, shaded at base and apex with fuscous; III, .58 mm, slender, fuscous; IV, .31 mm, fuscous. Rostrum, reaching to near apex of middle coxae, black. Pronotum, length .47 mm, width at base 1.05 mm, basal angles rounded, black. Hemelytra more strongly reddish orange. Ventral surface and legs reddish orange, shaded with fuscous. Tibiae reddish orange, spines black, without spots at base.

Holotype: ♂ June 14, 1965, Area TM, Nevada Test Site (D E. Beck, H. H. Knight & J. M. Merino). **Allotype:** ♀ taken with the type. **Paratypes:** 2♂ 10♀ taken with the types on *Ephedra nevadensis* which is the host plant of the species. Area CM, 3♀ June 13, 1965; Area CU, 4♀ June 13; Area 6M, ♂ 6♀ June 15; Area 17M, 4♂ 9♀ June 12; Area 18M, ♂ ♀ 3 nymphs June 11; Area 19M, ♂ 3♀ June 23; Area 401M, ♂ ♀ June 18, 4♂ 3♀ June 20, ♀ July 7, 1965, Nevada Test Site (D E. Beck, H. H. Knight & J. M. Merino), all collected on *Ephedra nevadensis*.

Genus *Hoplomachidea* Reuter

Hoplomachidea consors Uhler

Hoplomachus consors Uhler, 1893:264.

Hoplomachidea consors Reuter, 1909:75.

The following material has been identified from the test site: Area 12M, 3♂ 1♀ June 11, 1965; Area 16M, 6♂ 4♀ June 11, 1965; Area 17M, 27♂ 12♀ June 11; 31♂ 10♀ June 12; 14♂ 7♀ June 16; 7♂ 4♀ June 17; Area 18M, 9♂ 5♀ June 11, 1965; Area 19M, ♂ June 22; 3♂ 1♀ June 23; 5♂ 6♀ June 24, 1965; Area CM, ♀ June 10, 1965; Area TE, 16♂ 4♀ June 10, 1965; Area 401M, 2♂ June 18, 1965.

This species was swept from three or four different plants, but greatest numbers were taken from *Phacelia crenulata* which appears to be a preferred host.

Genus *Criocoris* Fieber

Criocoris saliens Reuter

Figs. 41, 70

Strongylotes saliens Reuter, 1876:88.

Criocoris saliens Van Duzee, 1914:29.

Criocoris saliens Knight, 1941:21, 49, Fig. 91.

This species is known from California, Washington, Idaho, Nebraska, Kansas, Texas, Iowa, Minnesota, Illinois and states eastward.

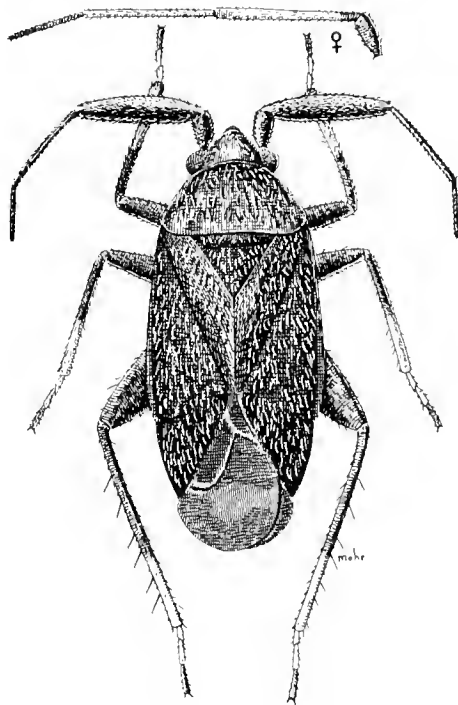


Fig. 70. *Criocoris saliens*, ♂.

Genus *Rhinacloa* Reuter

Rhinacloa forticornis Reuter

Rhinacloa forticornis Reuter, 1876:80.

Rhinacloa forticornis Knight, 1941:50, Fig. 81.

Records for the Nevada Test Site are as follows: Area 5HN ♂ June 10, 1964; Area 5M, 2♂ June 12, ♂ Aug. 13, 2♂ 1♀ Aug. 18, 1965; Area 12CI, 3♂ 4♀ June 18, 1964, on *Rumex salicifolius*; Area 12M, 2♀ July 1, 4♂ 1♀ Aug. 6, 10♂ 10♀ Aug. 7, 2♂ 1♀ Aug. 9, 4♂ 2♀ Aug. 11, ♂ ♀ Aug. 13, ♂ ♀ Aug. 23, 3♂ 2♀ Aug. 24, 2♂ Aug. 26, 1965; ♀ Aug. 7, 1965, on

Chenopodium leptophyllum; ♀ Aug. 26, 1965, on *Eriogonum*; ♀ Aug. 23, 1965, on *Stanleya pinnata*; Area 16M ♂ Aug. 19, 1965, on *Franseria acanthicarpa*; Area 17M, ♂ ♀ June 17, 1965, on *Sphaeralcea*; ♀ July 1, ♀ Aug. 30, 1965, on *Malacothrix glabrata*; Area 18M, 4♂ 3♀ Aug. 23, ♀ Aug. 23, 1965, on *Eriogonum nodosum*; ♂ Aug. 23, 1965, on *Sphaeralcea*; Area 19M, 2♀ June 22, ♀ June 23, ♀ Aug. 30, 1965; Area 401M, ♂ June 18, ♂ July 21, 2♀ Aug. 20, 1965; Area TM ♀ June 14, 1965.

Some of the above specimens were found on each of the following plants: *Franseria acanthicarpa*, *Chrysothamnus nauscosus*, *C. parryi*, *C. paniculata*, *Eriogonum nodosum*, *E. deflexum*, *Chenopodium leptophyllum*, *Rumex salicifolius*, *Stanleya pinnata*, *Sphaeralcea* sp., *Tetradymia glabrata*, *Malacothrix flabrata*, *Tamarix pentandra* (imported plant).

While *Rhinacloa forticornis* was found on all the above different plants, it was never found in large numbers on a single plant, as most sap-feeding bugs are. I hazard a guess that this small bug must be predaceous. The only group of small arthropods commonly found on these plants, and suitable for food, are thrips (Thysanoptera).

Genus *Ranzovius* Distant

Ranzovius moerens (Reuter)

Nyctella mocrens Reuter, 1905:36.

Excentricus mexicanus Van Duzee, 1923:163.

Ranzovius moerens Carvalho, 1958:136, cat.

This species has a wide distribution, being recorded from Venezuela, Mexico, California and Florida. Additional records: ♂ June 26, 1924, Santa Rita Mts.; ♀ June 12, 1928, alt. 4000 ft, Patagonia (A. A. Nichol); ♂ Aug. 10, ♀ Aug. 16, 1905, Huachuca Mts., Arizona (H. G. Barber). 10♂ ♀ July 21, 1966, College Station, Texas (J. C. Schaffner), nymphs and adults found inhabiting spider webs. This mode of life helps to explain the wide distribution of the species, for spider webs everywhere are much the same, with the bugs probably scavengers on some of the insects caught in the web.

Beckocoris, new genus

Arolia hairlike, two bristles arising from between base of claws; pseudarolia large, attached along basal half, apical half free and extending to near apex of claw (Fig. 16); characters that place *Beckocoris* in subfamily Phylinae. Distinguished in the generic key by the very broad head, which in width slightly exceeds

basal width of pronotum. Clothed with two types of pubescence, with appressed, sericeous pubescence, and intermixed with suberect simple hairs. Rostrum reaching beyond hind coxae or upon fourth ventral segment. Antennae rather short, length of second antennal segment not equal to width of head. Head vertical, vertex very broad. Hemelytra, membrane and veins, also the type of genital segment, all typical of the Phylinae. Left genital clasper much like *Europiella*, with tip of flagellum turned to the left side and resting in the cleft of left clasper. Tibial spines black, with a distinct black spot at base of spines. Type of the genus: *Beckocoris laticephalus*, new species.

This genus is named in honor of Dr. D Elden Beck who collected some of the type material and has done so much to promote biological research at the test site.

Beckocoris laticephalus, new species

Figs. 16, 71

Distinguished in the generic key by the broad head which in width is slightly greater than basal width of pronotum.

Male. Length 3.1 mm, width 1.25 mm. Head: width 1.10 mm, vertex .65 mm; white, each side of vertex with a granular black spot which suggests a degenerated ocellus; each side of frons with a subarcuate black mark having granular surface; clypeus with base, apex, and geminate lines on basal half, black; lora black. Antennae: segment I, length .24 mm, black, narrow apex pale; II, .75 mm, cylindrical, pallid, narrow base fuscous; III, .50 mm, pale to fuscous; IV, .31 mm, fuscous. Rostrum, length 1.12 mm, reaching slightly behind posterior coxae, or to the fourth ventral segment; pallid, apical half infuscated. Pronotum, length .51 mm, width at base 1.05 mm; pallid, calli black. Scutellum and mesonotum fuscous to black. Dorsal surface clothed with appressed, silvery, sericeous pubescence, and intermixed with suberect, pale simple hairs. Hemelytra pallid to white, corium inside of radial vein with a longitudinal black stripe, but not covering inner apical angle of corium; euneus white, central area blackish. Membrane pale, apical half shaded with light fuscous, central area nearly clear, veins white. Thorax white, sternum and spot behind propleura, black. Venter white, genital segment black except along median line below. Shape of left clasper much like that of *Europiella* species, tip of flagellum turned to the left side and resting in cleft of left clasper. Legs white, femora with

black dots, three large spots along ventral edge, six or seven smaller dots along anterodorsal aspect, a subapical black band that widens to a triangular spot on posterior aspect. Tibiae white, spines and spot at base of each, black; tarsi pale, apical half and claws fuscous to black.

Female. Length 2.9 mm, width 1.36 mm. Head: width 1.19 mm, vertex .75 mm; white, with ocellar spots and black marks as in the male. Rostrum, length 1.18 mm, reaching behind posterior coxae, almost to base of ovipositor. Antennae: segment I, length .24 mm, black, narrow apex pale; II, .64 mm, cylindrical, more slender than segment I, pallid, fuscous on base; III, .40 mm, pale fuscous; IV, .30 mm, fuscous. Ventral surface white, sternum black; venter white, a narrow impressed lateral line, also bordering ovipositor, black. Legs white, marks on femora and tibia dots, similar to the male.

Holotype: ♂ June 17, 1965, Area 17M, Nevada Test Site (H. H. Knight & J. M. Merino).

Allotype: ♀ taken with the type. **Paratypes:**

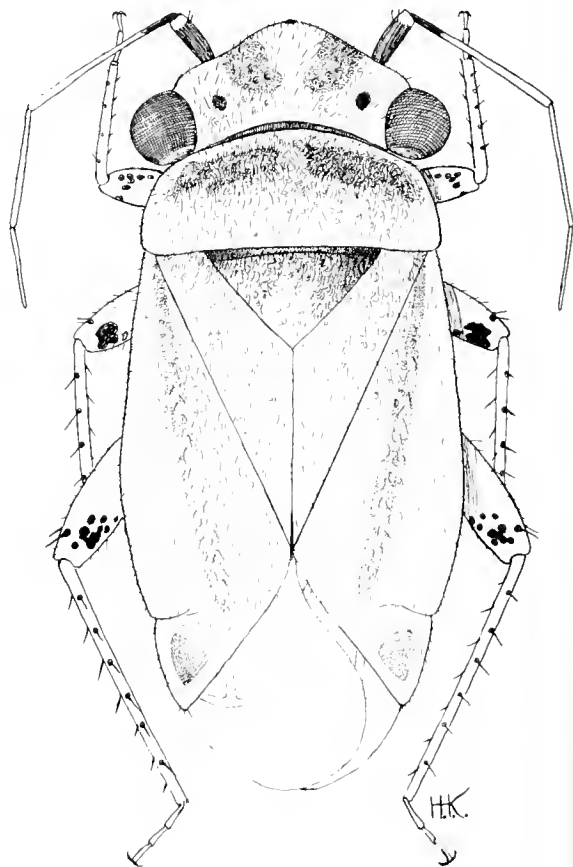


Fig. 71. *Beckocoris laticephalus*, ♀.

30♂ ♀ taken with the types on *Chrysothamnus* June 18, 1965, Area 401M, Nevada Test Site
nauseosus. 2♂ 2♀ June 12, 5♂ 7♀ June 16, (D E. Beck, H. H. Knight & J. M. Merino),
♂ July 1, 1965, Area 17M; 2♂ 1♀ June 17, mostly taken on *Chrysothamnus nauseosus*, the
Area 6M; 5♀ June 14, Area TM; 8♂ 16♀ host plant.

Genus *Europiella* Reuter

Key to the Species

- 1. Antennae clear yellow, red, orange or reddish brown 2
Antennae pallid, or yellowish brown, fuscous or black 8
- 2. Hemelytra pallid to green, red on base; head, antennae, thorax and femora, red
to reddish; length 2.8-3.4 mm *rubricornis*, n. sp.
Color pattern otherwise 3
- 3. Ventral surface fuscous to black 4
Ventral surface not black 6
- 4. Rostrum reaching upon hind coxae 5
Rostrum just reaching upon middle coxae; femora black, pale on apex; length
(♂) 3.8 mm *nigrofemoratus*, n. sp.
- 5. Antennae red or reddish; second antennal segment of the male not equal to
width of head; length 2.7-2.9 mm *lycii*, n. sp.
Antennae and legs yellow; femora yellow but may be fuscous on base; length of
second antennal segment of male equal to width of head; length 2.7-3.4 mm
..... *grayiae*, n. sp.
- 6. Rostrum reaching beyond apex of hind coxae 7
Rostrum just reaching upon hind coxae; venter pale to yellowish; antennae
orange colored; length 2.7-3.0 mm *humeralis* Van D.
- 7. Venter green; length of antennal segment II subequal to width of vertex plus
dorsal width of an eye; length 2.7 mm *viridiventris*, n. sp.
Venter reddish brown; length of antennal segment II greater than width of ver-
tex plus dorsal width of an eye; length 2.9-3.0 mm *rufiventris*, n. sp.
- 8. Hind femora with fuscous or reddish brown dots or spots 9
Hind femora and coxae uniformly brownish, without dots or spots; length 2.2-
2.5 mm *nicholi*, n. sp.
- 9. Antennal segment I black, or at least black on basal half 10
Antennal segment I pallid, or pale brownish, at least more pallid than black .. 16
- 10. Rostrum reaching upon hind coxae 12
Rostrum not reaching beyond middle coxae 11
- 11. Length of second antennal segment not equal to width of head; length 2.8-3.0
mm *stigmosa* (Uhl.)

- Length of second antennal segment distinctly greater than width of head; length (♀) 3.1 mm, (♂) 3.7 mm *angulatus* (Uhl.)
12. Length of second antennal segment not exceeding width of head, or hind femora pallid and with black spots 13
- Length of second antennal segment greater than width of head (♂); rostrum reaching upon posterior trochanters; hind femora fuscous; length 3.5 mm *concinna* Reut.
13. Ventral surface blackish; hind femora dark fuscous to black, no black spots clearly visible; width of vertex (♀) just half the width of head; length 2.3-2.7 mm *decolor* (Uhl.)
- Ventral surface pallid, venter fuscous (♂); hind femora pallid, but with distinct black spots 14
14. Length of second antennal segment not equal to width of head (♀), or (♂) slightly longer, head dark 15
- Length of second antennal segment subequal (♀) to, or slightly greater (♂) than width of head; length 3.0-3.2 mm *yampae*, n. sp.
15. Head pallid, antennae uniformly black; length 2.5-2.6 mm *nigricornis*, n. sp.
- Head dark, antennae black but segment II paler apically; (♀) segment II pallid on apical half; length 3.0-3.2 mm *pilosula* (Uhl.)
- 16(9). Knee or base of tibia without a black spot 17
- Knee or base of tibia with a black spot; length 2.9-3.2 mm *unipuncta*, n. sp.
17. Rostrum reaching upon posterior trochanters 18
- Rostrum not reaching beyond hind coxae 19
18. Venter reddish brown; rostrum reaching slightly beyond posterior trochanters; length (♀) 2.7 mm *balli*, n. sp.
- Venter yellowish green; rostrum reaching upon base of posterior trochanters; length 2.7-2.9 mm *brevicornis*, n. sp.
19. Head and dorsal surface dark fuscous to black, antennae reddish brown; length 2.8-3.9 mm *arizonae*, n. sp.
- Head and dorsal surface not uniformly black, at least the hemelytra paler 20
20. Antennae, lower half of head, and the coxae, brown to reddish brown; hind femora with 3 or 4 reddish brown spots on ventral margin; length 2.7-3.0 mm *humeralis* Van D.
- Color pattern otherwise 21
21. Antennae pale yellowish to light yellowish brown; head, pronotum, coxae and femora yellowish brown; hemelytra pale to dusky, hind femora without prominent spots; length 2.7-3.0 mm *montanae*, n. sp.
- Color pattern otherwise 22
22. Head and coxae fuscous; dorsal surface pallid, calli and basal half of scutellum fuscous to black; length 2.3-2.5 mm *stitti*, n. sp.

- Color pattern otherwise 23
23. Dorsal surface with simple fuscous hairs intermixed with white sericeous pubescence 24
- Dorsal surface with simple white hairs only, intermixed with white sericeous pubescence; length 3.5 mm *albipubescens*, n. sp.
24. Length of second antennal segment not exceeding width of head 25
- Length of second antennal segment greater than width of head; length 2.7-3.1 mm *punctipes*, n. sp.
25. Rostrum reaching upon apex of middle coxae; antennal segments I and II pallid (♀); length 2.8-3.0 mm *sparsa* Van D.
- Rostrum not reaching apex of middle coxae; antennal segment I fuscous beneath; (♀) length 3.2 mm *angulatus* (Uhl.)

Europiella rubricornis, new species

Distinguished from related species by the red antennae and femora; the pallid, subtranslucent hemelytra narrowly red across base; head and thorax reddish brown, venter pale green.

Male. Length 3.7 mm, width 1.3 mm. Head: width .85 mm, vertex .47 mm; reddish brown above, lower face red. Rostrum, length .95 mm, reaching upon apex of middle coxae. Antennae: segment I, length .21 mm, red; II, .68 mm, cylindrical, more slender near base, thickness nearly equal to segment I, ruby red; III, .58 mm, slender, pale fuscous; IV, .30 mm, pale fuscous. Pronotum, length .46 mm, width at base 1.05 mm, brownish black. Mesonotum and basal half of scutellum brownish black. Dorsal surface clothed with recumbent, simple pale hairs, more brownish over the dark areas, and intermixed with more appressed, silvery, sericeous pubescence. Hemelytra pallid, subtranslucent, reddish brown across the narrow base. Membrane pale dusky, translucent, veins pallid. Thorax dark reddish brown, sides with silvery sericeous pubescence. Legs red, hind tibiae white, the brownish black spines with red spot at base of each; tarsi pallid. Venter pale green, clothed with pale or white simple pubescence. Genital segment typical for the genus.

Female. Length 2.6 mm, width 1.36 mm, costal margin moderately arcuate. Head: width .88 mm, vertex .54 mm. Rostrum, length 1.02 mm, reaching to base of hind coxae, reddish. Antennae: segment I, length .22 mm, reddish; II, .72 mm, yellowish red or orange colored. Pronotum, length .41 mm, width at base 1.02 mm. Shorter and more robust than the male, but very similar in color and pubescence.

Holotype: ♂ June 11, 1930, Richfield, Utah (E. W. Davis), taken at light. **Allotype:** ♀ June 26, 1926, LaGrande, Oregon (E. W. Davis). **Paratypes:** ♀ taken with the allotype. 2♂ June 11, 1930; 6♂ July 15, 6♂ Aug. 15, 1929; 2♂ June 11, 1930, Richfield (E. W. Davis), ♀ June 8, 1940, White Valley, Millard County, Utah (R. W. Fautin).

Europiella nigrofemoratus, new species

Allied to *lycii* but distinguished by the shorter rostrum and by the black femora.

Male. Length 3.8 mm, width 1.4 mm. Head: width .84 mm, vertex .44 mm, black. Rostrum, length .95 mm, reaching to apex of middle coxae, black. Antennae: segment I, length .18 mm, yellow; II, .85 cylindrical, yellow; III, .58 mm, dusky yellow; IV, missing. Pronotum, length .47 mm, width at base 1.12 mm, black. Mesoscutum and scutellum black. Hemelytra dark fuscous to black, cuneus with same depth of dark color as the corium, only slightly paler at the fracture. Membrane uniformly fuscous, veins at apex of areoles, paler. Dorsal surface clothed with rather short, recumbent, yellowish to golden simple hairs, and intermixed with prostrate and appressed, silvery, sericeous pubescence; propleura and sides of thorax also with silvery, sericeous pubescence. Ventral surface black, venter moderately shining. Legs black, tips of femora, and more broadly on front pair, yellowish; tibiae pallid, spines and spot at base of each, black; tarsi pale, tips fuscous.

Holotype: ♂ June 17, 1965, Area 17M, Nevada Test Site (H. H. Knight & J. M. Merino), swept from *Atriplex canescens*. **Paratypes:** Other specimens from the Nevada Test Site: ♂ June

10, 1965, Area TE; ♂ June 12, 1965, Area 5M, at southeast edge of Frenchman Flat, edge of foot hills of the Ranger Mts.; 2♂ June 14, 1965, Area 401M; (D E. Beck, H. H. Knight & J. M. Merino). ♂ July 7, 1965, Area 18M, taken on *Atriplex canescens* (D E. Beck & J. M. Merino). While only two specimens were collected on *Atriplex canescens* taken in separate locations, it is an indication that this plant may prove to be the host plant of the species.

Europiella nigricornis, new species

Allied to *decolor* Uhler but differs in the shorter second antennal segment, which in length does not equal width of head; width of vertex greater than half the width of head.

Male. Length 2.6 mm, width 1.05 mm. Head: width .68 mm, vertex .41 mm; frons broadly convex, pallid. Antennae: segment I, length .17 mm, black; II, .61 mm, not equal to width of head, black, cylindrical, bearing very short pale pubescence; III, .44 mm, fuscous; IV, .30 mm, fuscous. Rostrum, length .92 mm, reaching to apex of hind coxae, pallid, apex black. Pronotum, length .41 mm, width at base .95 mm; pallid, calli indicated by dusky color; anterior angles of disk bearing a single black bristle. Scutellum and mesonotum pallid to dusky. Dorsal surface clothed with suberect, simple pale hairs, intermixed with more appressed, pale to silvery, sericeous pubescence. Hemelytra pallid, subtranslucent, cuneus becoming infuscated in darkest specimens; membrane pale to dusky, veins pallid. Ventral surface pale to fuscous. Legs pallid, darkest specimens becoming dusky, but spots on femora showing clearly; anterior face of hind femora with double row of evanescent dots, ventral margin with two strong spots, dorsal margin with four or five spots, the subapical spot double and provided with two black bristles; median lines with small dots, all of which disappear when viewed under certain angles of light. Tibiae pallid, spines black and each with a strong black spot at base, the base or knees black; tarsi pale, apex and claws fuscous to black. Ventral surface pallid, darkest specimens with some fuscous, but femora never so dark as to obscure the black spots, which may be said of *decolor* Uhler.

Female. Length 2.5 mm, width 1.3 mm. Head: width .68 mm, vertex .42 mm; frons more rounded and convex, eyes brown. Antennae: segment I, length .17 mm, black; II, .52 mm, cylindrical, slightly thicker on apex, black, no

sign of turning paler apically as is true of *decolor*; III, .44 mm, fuscous; IV, .30 mm, fuscous. Pronotum, length .41 mm, width at base, pallid, no shading to indicate the calli. Ventral surface and legs pallid, dark spots on legs show clearly, femora never black as is true of *decolor*. Body more robust than the male, but color and pubescence very similar.

Holotype: ♂ June 17, 1965, Area 6M, Nevada Test Site (H. H. Knight & J. M. Merino). **Allotype:** ♀ June 22, 1965, Area 401M, Nevada Test Site (H. H. Knight & J. M. Merino). **Paratypes:** 9♂ 3♀ June 11, Area 18M; ♂ June 18, 2♀ June 23, ♂ ♀ June 19, Area 19M; ♂ ♀ June 12, ♂ June 14, ♀ Aug. 28, Area 5M; ♂ June 14, Area TM; ♀ Aug. 9, Area 12M; Area 12CI, ♀ June 18, 1964, Nevada Test Site (D E. Beck, H. H. Knight & J. M. Merino). Host plant is *Artemisia tridentata*.

Europiella lycii, new species

Allied to *grayiae* but distinguished by the red antennae, and male with length of second antennal segment not equal to width of head.

Male. Length 2.9 mm, width 1.2 mm. Head: width .82 mm, vertex .43 mm; fuscous above, ventral half of head pale to reddish. Antennae: segment I, length .18 mm, reddish; II, .71 mm, cylindrical, reddish to clear red; III, .36 mm, pale fuscous; IV, .30 mm, fuscous. Rostrum, length .98 mm, reaching to posterior trochanters, reddish, apex blackish. Pronotum, length .44 mm, width at base .98 mm, black. Dorsal surface, including head, clothed with appressed, silvery sericeous pubescence, and intermixed with simple, suberect, pale to brownish hairs. Scutellum and mesonotum fuscous to black. Hemelytra dark fuscous, embolium and narrow edge of cuneus, paler; membrane pale fuscous, veins pallid. Ventral surface fuscous to blackish; sides of thorax with appressed, silvery sericeous pubescence. Legs fuscous to brownish, femora paler on apical half, dots showing in some angles of light; tibiae pale, spines black, spots at base of spines red to blackish; tarsi pale, apices and claws black.

Female. Length 2.7 mm, width 1.3 mm. Head: width .85 mm, vertex .47 mm; fuscous to black on vertex and frons, lower half reddish. Antennae: segment I, length .20 mm, red; II, .78 mm, red, cylindrical, slightly more slender on basal half, finely pubescent; III, .27 mm, reddish; IV, .24 mm, fuscous red. Rostrum, length .98 mm, reddish, apex black, reaching to

posterior trochanters. Pronotum, length .38 mm, width at base .98 mm. Color and pubescence very similar to the male but hemelytra more broadly pale, basal area of clavus and corium, and apex of scutellum pallid. Ventral surface pallid to fuscous. Legs reddish, tibiae pallid, spines black, dots at base of spines reddish.

Holotype: ♂ June 12, 1965, Area CM, Nevada Test Site (D E. Beck, H. H. Knight & J. M. Merino), taken on *Lycium andersoni*, the host plant. **Allotype:** ♀ same data as the type. **Paratypes:** 8♂ 5♀ and nymphs taken with the types on *Lycium andersoni*. 2♂ June 13, 1965, Area CM; 6♂ 2♀ June 15, 1965, Area 6M (D E. Beck, H. H. Knight & J. M. Merino); ♀ May 12, 1961, Area 4DB, on *Lycium andersoni*; ♀ May 30, 1961, Area 5DB, on *Lycium andersoni*; ♀ March 14, 1962, Area CBA14, Nevada Test Site.

Europiella grayiae, new species

Allied to *lycii*, rather similar in color, but distinguished by having male second antennal segment equal to width of head.

Male. Length 3.4 mm, width 2.0 mm. Head: width .85 mm, vertex .50 mm; vertical in position, tip of clypeus directly beneath antennal fossa; black, lora yellow. Antennae: segment I, length .18 mm, yellow; II, .85 mm, cylindrical, slightly more slender at base, with short pale pubescence; III, .51 mm, pale to fuscous; IV, .31 mm, fuscous. Rostrum, length .92 mm, reaching apex of middle coxae, yellow, apical half blackish. Pronotum, length .47 mm, width at base 1.1 mm; black, smooth, not shining; calli indistinct, disk and whole dorsal surface clothed with suberect, yellowish to fuscous simple pubescence, intermixed with more appressed, silvery, sericeous pubescence. Scutellum and mesonotum black. Hemelytra fuscous, embolium pale dusky, cuneus fuscous, narrow outer margin paler; membrane and veins pale fuscous, slightly paler along inner margin of cuneus. Ventral surface of thorax, coxae, and venter black. Legs pallid to yellowish, basal half of middle and hind coxae fuscous, in a few specimens the hind coxae nearly all black; tibial spines and the spot at base, black.

Female. Length 2.7 mm, width 1.36 mm. Head: width .88 mm, vertex .47 mm; ventral half yellowish orange, vertex and frons blackish, clothed with sericeous silvery hairs above; vertical in position, tip of clypeus directly beneath antennal fossa. Rostrum, length .95 mm, reaching upon hind coxae, yellow, apex blackish. An-

tennae: segment I, length .20 mm, orange yellow; II, .78 mm, cylindrical, yellow; III, .51 mm, fuscous; IV, .27 mm, fuscous. Pronotum, length .44 mm, width 1.05 mm, more than twice wider than long. Coloration and pubescence of dorsal surface similar to the male, but base of corium becoming paler. Ventral surface black, but legs including coxae orange yellow, tibiae pallid, spines and spots at base black.

Holotype: ♂ June 11, 1965, Area 18M, Nevada Test Site (D E. Beck, H. H. Knight & J. M. Merino). **Allotype:** ♀ taken with the type. **Paratypes:** 19♂ 14♀ taken with the types on *Grayia spinosa*, the host plant. 3♂ 3♀ June 11, ♂ June 24, 1965, Area 16M; ♂ June 12, Area 5M; ♂ ♀ June 10, Area TE; ♀ June 14, Area TM; ♂ June 17, Area 17M; 6♂ 6♀ June 14, 10♂ 2♀ June 18, Area 401M; ♂ ♀ July 17, 1965, Area 18M (D E. Beck, H. H. Knight & J. M. Merino); ♂ May 2, 1960, Area 4DA1; ♀ May 2, 1961, Area 4DA, on *Grayia spinosa*; ♂ June 21, 1961, Area 6DD, Nevada Test Site.

Europiella angulata (Uhler)

Maurodactylus angulatus Uhler, 1895:53, n. sp.

This species does not belong in *Maurodactylus* Reut. as assigned by Uhler. It differs from typical *Europiella* species only by the slightly longer antennal segments, but this character alone does not warrant making a separate genus. The broad vertex, nearly vertical front, and short rostrum, places this species in *Europiella* rather than *Psallus* Fieb.

This species was described from Steamboat Springs, Colorado, where I have collected it; also taken at Veta Pass, Gunnison, and Dolores in Colorado; many specimens taken from *Chrysothamnus*. Additional records from Utah: 6♂ 2♀ July 15, 1929, Richfield (E. W. Davis), taken at light trap; ♂ ♀, Widdsoe; ♀, Bryce Canyon (V. M. Tanner).

Europiella humeralis (Van Duzee)

Sthenarus humeralis Van Duzee, 1923:162, n. sp.

This species was described from numerous specimens collected by Mr. Van Duzee from bushes of *Lycium richi* at Loreto, Lower California. I have specimens from Arizona that I believe are identical since making comparison with paratypes.

New records: 6♂ ♀ May 9, 1926, alt. 1300 ft. Salt River Mts., ♂ April 1926, alt. 2400 ft. Tucson, Arizona (A. A. Nichol).

Europiella viridiventris, new species

Allied to *rufiventris* but distinguished by the green venter; also by length of second antennal segment which is subequal to width of vertex plus dorsal width of an eye.

Female. Length 2.7 mm, width 1.3 mm. Head: width .92 mm, vertex .51 mm; fuscous brown. Rostrum, length 1.05 mm, reaching upon posterior trochanters, reddish brown. Antennae: segment I, length .20 mm, reddish yellow; II, .78 mm, subcylindrical, reddish yellow; III, .51 mm, pale yellowish; IV, .30 mm, dusky yellow. Pronotum, length .40 mm, width at base 1.20 mm, fuscous brown. Mesoscutum fuscous brown, scutellum fuscous, apex paler. Hemelytra rather uniformly pale fuscous; membrane pale fuscous, veins paler. Dorsal surface clothed with rather short, recumbent, golden brown to fuscous simple hairs, and intermixed with prostrate and appressed, silvery, sericeous pubescence. Thorax fuscous to reddish brown; venter uniformly pale yellowish green. Coxae reddish brown; femora pallid to pale brownish yellow, ventral margin of anterior aspect with 2 or 3 reddish brown spots, also several tiny dots along median line and the apical area; tibiae pallid, spines black with a large red brown spot at base of each; tarsi pale, apex fuscous.

Male. Length 2.7 mm, width 1.15 mm. Head: width .80 mm, vertex .44 mm. Rostrum, length .92 mm, reaching upon posterior trochanters, yellowish brown. Antennae: segment I, length .17 mm, brownish yellow; II, .64 mm, reddish brown; III, missing. Pronotum, length .37 mm, width at base .92 mm. More slender than the female but very similar in color and pubescence.

Holotype: ♀ April 8, 1940, Tempe, Arizona (L. L. Stitt). **Allotype:** ♂ taken with the type. **Paratypes:** ♂ taken with the types on *Lycium*. ♀ Dec. 20, 1939, Yuma County; 2 ♀ April 6, 1940, Coldwater; ♀ April 9, 1942, Chandler, Arizona (L. L. Stitt).

Europiella rufiventris, new species

Runs in the key to the couplet with *viridiventris* from which it may be distinguished by the reddish venter, also by the relatively longer second antennal segment.

Female. Length 3.0 mm, width 1.4 mm. Head: width .92 mm, vertex .54 mm; fuscous brown. Rostrum, length 1.1 mm, reaching upon posterior trochanters, yellowish brown. Antennae: segment I, length .20 mm, brownish yellow, a setigerous red spot on apical half; II, .85 mm, reddish brown to orange colored; III, .51 mm, yellowish brown; IV, .30 mm, dusky brown. Pronotum, length .45 mm, width at base 1.09 mm, brownish black. Mesoscutum and scutellum dark fuscous brown, apex of scutellum pale. Hemelytra, pale fuscous to fuscous brown, embolium and base of corium more pallid. Membrane pale dusky brown, veins somewhat paler. Dorsal surface clothed with rather short, recumbent to suberect, dark brown to fuscous simple hairs, and intermixed with more appressed, silvery, sericeous pubescence. Ventral surface pale to reddish brown, venter strongly reddish brown, edges of segments more or less pallid. Coxae dark reddish brown; femora pale to brownish, ventral half paler, marked with several small, and 3 or 4 larger reddish brown spots on ventral margin; tibiae pallid to white, spines black, each with a large red brown spot at base; tarsi pale yellowish, tips fuscous.

Male. Length 3.1 mm, width .64 mm. Head: width .90 mm, vertex .48 mm. Rostrum, length 1.05 mm, reaching to tips of posterior trochanters. Antennae: segment I, length .20 mm, brownish yellow, a red brown spot on dorsal surface; II, .82 mm, reddish brown; III, .54 mm; IV, .30 mm. Pronotum, length .44 mm, width at base 1.06 mm. Less robust than the female, but very similar in color and pubescence.

Holotype: ♀ April 8, 1940, Tempe, Arizona (L. L. Stitt). **Allotype:** ♂ April 6, 1940, Coldwater, Arizona (L. L. Stitt). **Paratypes:** 2 ♀ taken with the type. 9 ♂ 7 ♀ taken with the allotype on *Lycium*; 2 ♂ Dec. 20, 1939, Yuma County; 2 ♀ April 9, 1942, Chandler; ♀ Feb. 3, 1941, Gila Bend, Arizona (L. L. Stitt).

Europiella nicholi, new species

Allied to *balli* but differs in the shorter rostrum, femora uniformly brownish, without dots or spots.

Female. Length 2.3 mm, width 1.15 mm. Head: width .75 mm, vertex .44 mm; brown. Rostrum, length .68 mm, reaching to middle of hind coxae, dark brown. Antennae: segment I, length .17 mm, yellowish brown; II, .62 mm, cylindrical, yellowish brown; III, .37 mm, brown; IV, .30 mm, brownish. Pronotum, length .36 mm, width at base .85 mm, brown. Mesonotum brown. Scutellum pallid. Dorsal surface clothed with short, simple, recumbent brown hairs, and intermixed with more appressed, golden brown sericeous pubescence; also with some silvery sericeous pubescence on scutellum, mesonotum,

and base of clavus. Hemelytra pale brownish, closely matted with golden sericeous pubescence; cuneus slightly darker brown, pallid at the fracture. Membrane pale to clear, tinted brownish, veins pale brownish. Ventral surface rather uniformly rich yellowish brown. Legs uniformly light yellowish brown, without dots or spots; tibial spines brownish black, without spots at base.

Male. Length 2.4 mm, width 1.0 mm. Head: width .72 mm, vertex .37 mm; brown. Rostrum, length .68 mm, reaching upon apex of hind coxae. Antennae: segment I, length .14 mm; II, .64 mm; III, .44 mm; IV, .23 mm; yellowish brown. Pronotum, length .34 mm, width at base .85 mm. More slender than the female, but very similar in color and pubescence.

Holotype: ♀ Aug. 19, 1926, alt. 2400 ft. Tucson, Arizona (A. A. Nichol). **Allotype:** ♂ taken with the type. **Paratypes:** ♂ 5 ♀ taken with the types on *Lycium torreyi*, which is the host plant. 6 ♀ Sept. 2, 1928, Rincon Mts., alt. 3300 ft (A. A. Nichol), taken on *Lycium torreyi*.

Europiella stigmosa Uhler

Fig. 72

Agalliastes stigmatus Uhler, 1893:379.

Europiella stigmosa Reuter, 1909:84.

Europiella umbrina Reuter, 1909:85.

I have examined co-types of *umbrina* Reut. and find the specimens are of the dark color form of *stigmosa* (Uhler). I have seen specimens of this species from Colorado, Utah, Nevada and California.

The following records are known from the Nevada Test Site: Area 401M, 10♂ 3♀ June 22, 8♂ 4♀ June 19, 1965; Area 19M, 2♂ June 22, 18♂ 8♀ June 23, 1965; Area 17M, 1♂ 2♀ June 11, 1965.

The host plant is *Artemisia tridentata* on which *stigmosa* has been found in Nevada, Utah and Colorado.

Europiella concinna Reuter

Europiella concinna Reuter, 1909:84.

I have placed this species in the key since it was described from Claremont, Calif. (Baker) and may well occur in southern Nevada. I have specimens from northern Arizona determined as this species.

Europiella decolor (Uhler)

Agalliastes decolor Uhler, 1893:380.

Europiella decolor Van Duzee, 1917, 415.

I have determined the following material from the Nevada Test Site: Area 401M, 9♂ ♀ June 18, 19♂ ♀ June 19, 1965; Area 19M, 13♂ ♀ June 23, 1965; Area 16M, ♂ June 11, 1965; Area 12M, 10♂ ♀ Aug. 13, 1965, all taken on *Artemisia tridentata*.

The host plant for this species is *Artemisia tridentata*, and it is usually found where this plant grows in abundance. I have identified *decolor* from Colorado, Utah, Nevada and California.

Europiella yampae, new species

Runs in the key to couplet with *nigricornis*, but separated from that species by the somewhat longer antennal segments.

Male. Length 3.2 mm, width 1.2 mm. Head: width .78 mm, vertex .47 mm; pallid, frons

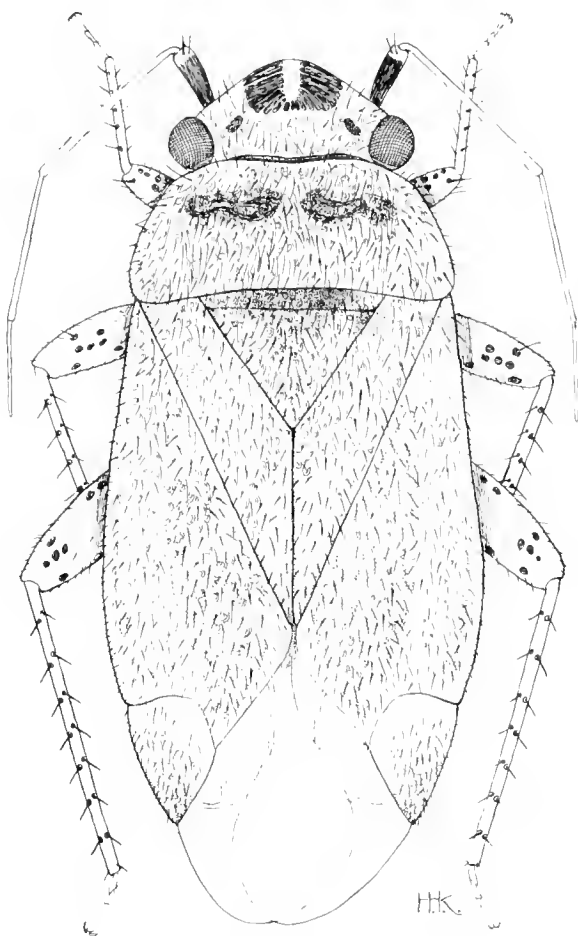


Fig. 72. *Europiella stigmosa*, ♀.

and lower half of head shaded with fuscous. Rostrum, length 1.12 mm, reaching upon middle of hind coxae. Antennae: segment I, length 1.12 mm, black, apex pallid; II, .82 mm, cylindrical, black, pale pubescent; III, .61 mm, black; IV, .44 mm, black. Pronotum, length .48 mm, width at base 1.05 mm; pallid, calli and area on anterior upper half of propleura, fuscous. Scutellum pallid, shaded with fuscous along basal suture and the apex. Hemelytra and pronotal disk pallid, clothed with appressed, silvery sericeous pubescence, and intermixed with recumbent and suberect, pallid simple pubescence. Membrane fuscous, veins pallid. Ventral surface fuscous. Legs pallid to yellowish, femora spotted with a double row series of fuscous dots, the spots larger and more distinct on posterior pair; tibiae with black spines and spots at base, knees with large black spot.

Female. Length 3.0 mm, width 1.3 mm. Head: width .76 mm, vertex .48 mm; white. Rostrum, length 1.09 mm, reaching to middle of hind coxae, pallid, apical half brownish black. Antennae: segment I, length .24 mm, black, apex pallid; II, .72 mm, pallid to greenish, basal half fuscous; III, .58 mm, fuscous; IV, .37 mm, fuscous. Pronotum, length .48 mm, width at base .98 mm. Ventral surface pallid or white, tinged with green. Legs pallid to white, spots on femora smaller than in the male; tibial spots and spines black, apical segment of tarsi fuscous.

Holotype: ♂ July 12, 1964, alt. 6700 ft, Steamboat Springs, Colorado (H. H. Knight). **Allotype:** ♀ taken with the type. **Paratypes:** 18♂ 15♀ July 12, 19♂ 2♀ July 13, 2♂ July 15, 1964, alt. 6700 ft, Steamboat Springs, Colorado (H. H. Knight), collected on a low growing *Artemisia*.

Europiella pilosula (Uhler)

Atomoscelis pilosulus Uhler, 1893:377.

Psallus pilosulus Van Duzee, 1917:407, cat.

Allied to *decolor* Uhler and *nigricornis*, n. sp., but may be separated as shown in the key. The type specimens of *pilosulus* Uhler were "collected on *Bigelovia* near American Fork, Utah, June 22, 1891 (E. A. Schwarz)." I collected this species Aug. 14, 1927, in the Shoshone National Forest, Wyoming. As yet this species has not been collected at the test site.

Europiella unipuncta, new species

Allied to *albipubescentis* in having only white pubescence, but differs on tibiae having a promi-

nent black spot at base; also not having the triangular shaped black tip on the flagellum.

Male. Length 3.2 mm, width 1.2 mm. Head: width .75 mm, vertex .40 mm; pallid. Antennae: segment I, length .20 mm, pallid; II, .78 mm, cylindrical, pale to yellowish; III, .40 mm, dusky; IV, .27 mm, dusky. Rostrum, length 1.03 mm, reaching upon apex of middle coxae, pallid, apex blackish. Pronotum, length .44 mm, width at base .95 mm; disk rather flat, calli scarcely defined, pallid. Dorsal surface uniformly pallid, clothed with moderately long, suberect, simple pale hairs, intermixed with more appressed, silvery sericeous pubescence. Scutellum and mesonotum pallid, sparsely set with pubescence. Hemelytra uniformly pallid; membrane and veins pale to dusky. Ventral surface pallid to white. Legs pallid, femora with numerous, small pale fuscous dots, a pair of preapical black bristles on dorsal surface; base of tibia, so-called knees with a conspicuous black spot from which the name is derived; tibial bristles black, with a black spot at base of each, bristles rather long, length more than twice the diameter of tibia; tarsi dusky, claws dark brown. Venter pallid to greenish white; right clasper curved, black in color.

Female. Length 2.9 mm, width 1.2 mm. Head: width .71 mm, vertex .44 mm; pallid. Antennae: segment I, length .20 mm; II, .64 mm, cylindrical, slightly more slender near base, pallid; III, .44 mm, pale; IV, .30 mm. Pronotum, length .42 mm, width at base .92 mm. Color and pubescence very similar to the male.

Holotype: ♂ Aug. 13, 1965, Area 12M, Nevada Test Site (J. M. Merino). **Allotype:** ♀ same data as type. **Paratypes:** 6♂ 9♀ all taken with the types on *Artemisia tridentata* by J. M. Merino. Also known from 2♂ 8♀ June 30, 1965, St. George, Utah (H. H. Knight), taken on *Artemisia*.

Europiella balli, new species

Allied to *brevicornis* but distinguished by the longer rostrum which reaches slightly beyond posterior trochanters; venter brownish red.

Female. Length 2.7 mm, width 1.3 mm. Head: width .85 mm, vertex .50 mm; black. Rostrum, length 1.05 mm, reaching slightly beyond posterior trochanters, pallid to reddish brown. Antennae: segment I, length .14 mm, yellowish brown; II, .64 mm, pale yellowish brown, apical one-fourth reddish brown; III, .44 mm, dusky brown; IV, missing. Pronotum,

length .39 mm, width at base 1.05 mm; brownish black. Mesonotum and scutellum brownish black. Hemelytra subtranslucent, uniformly fuscous brown. Membrane pale fuscous brown, veins pallid. Dorsal surface clothed with short, recumbent, simple brownish hairs, and intermixed with recumbent and appressed, silvery, sericeous pubescence. Ventral surface fuscous to reddish brown, venter more reddish than brown. Legs reddish brown, femora marked with darker spots, ventral margin with four or five reddish brown spots; tibiae pallid, set with prominent black spines, each with a red-brown spot at base; tarsi pale, apical segment fuscous to black.

Holotype: ♀ May 12, 1929, Tucson, Arizona (E. D. Ball). Named for the collector, Dr. E. D. Ball, who spent some three years in Arizona, and was an active collector of Homoptera and Hemiptera.

Europiella brevicornis, new species

Runs in the key to the couplet with *balli* from which it may be separated by the shorter rostrum; venter yellowish green.

Male. Length 2.7 mm, width 1.2 mm. Head: width .81 mm, vertex .44 mm; fuscous to brownish black. Rostrum, length .95 mm, reaching upon base of posterior trochanters, yellowish brown. Antennae: segment I, length .17 mm, yellowish brown; II, .66 mm, cylindrical, reddish brown; III, .51 mm, pale yellowish; IV, .30 mm, dusky yellow. Pronotum, length .37 mm, width at base .95 mm; dark fuscous brown. Mesonotum and scutellum fuscous brown, apex of scutellum paler. Hemelytra subtranslucent, darkened with pale fuscous, embolium and cuneus somewhat paler. Membrane nearly clear, veins pallid. Dorsal surface clothed with short, recumbent, golden yellow to brown simple hairs, and intermixed with recumbent and appressed, silvery sericeous pubescence. Ventral surface of thorax pale to fuscous. Venter pale greenish yellow. Coxae reddish brown, femora pale to reddish brown; hind femora nearly white beneath, marked with three large and one small red-brown spots; tibiae pallid, spines black, each with a large red-brown spot at base; tarsi pallid, tips fuscous.

Female. Length 2.7 mm, width 1.3 mm. Head: width .85 mm, reaching upon base of posterior trochanters. Antennae: segment I, length .17 mm; II, .71 mm, yellowish brown; III, .37 mm; IV, .34 mm. Pronotum, length .42 mm, width at base .98 mm. Slightly more robust

than the male, but very similar in color and pubescence.

Holotype: ♂ April 19, 1926, alt. 2400 ft, Tucson, Arizona (A. A. Nichol). **Allotype:** ♀ taken with the type. **Paratypes:** 5♂ 2♀ same data as the types.

Europiella arizonae, new species

Runs in the key to the couplet with *brevicornis*, from which it may be separated by the longer second antennal segment of the male, length subequal to width of head; hind femora with a few small brownish dots.

Male. Length 3.7 mm, width 1.3 mm. Head: width .88 mm, vertex .47 mm; dark fuscous brown. Rostrum, length 1.02 mm, reaching upon apex of hind coxae, brown. Antennae: segment I, length .20 mm, dark brown; II, .88 mm, fuscous brown; III, .44 mm, brown; IV, .31 mm, brown. Pronotum, length .54 mm, width at base 1.19 mm; brownish black. Mesonotum and scutellum brownish black. Hemelytra subtranslucent, medium fuscous brown, slightly paler at base of corium; cuneus fuscous brown, slightly paler, subtranslucent. Membrane uniformly pale fuscous, veins pallid. Dorsal surface clothed with recumbent to suberect simple brownish hairs, intermixed with more appressed silvery sericeous pubescence. Ventral surface pale yellowish brown, mesosternum dark brown. Legs pale brownish, femora paler on ventral half, having a few brown dots; tibiae pallid, with brownish tinge, tibial spines and spots at base, dark brown.

Female. Length 2.8 mm, width 1.4 mm. Head: width .92 mm, vertex .52 mm. Rostrum, length 1.0 mm, reaching upon apex of hind coxae. Antennae: segment I, length .20 mm; II, .78 mm; III, .47 mm; IV, .30 mm; yellowish brown. Pronotum, length .47 mm, width at base 1.15 mm. Shorter, broader and more robust than the male, but very similar in color and pubescence.

Holotype: ♂ Feb. 13, 1941, Gila Bend, Arizona (L. L. Stitt). **Allotype:** ♀ same data as the type. **Paratypes:** 6♂ 10♀ taken with the types.

Europiella montanae, new species

Distinguished from related species by the uniformly pale yellowish to light yellowish brown antennae; hemelytra pale to dusky, hind femora without prominent spots.

Male. Length 3.0 mm, width 1.26 mm. Head: width .85 mm, vertex .48 mm; dark brown, cly-

peus and juga brownish yellow. Rostrum, length .98 mm, reaching upon middle of hind coxae, brownish yellow. Antennae: segment I, length .20 mm, brownish yellow; II, .85 mm, pale brownish yellow, thickness subequal to segment I; III, .61 mm, pale dusky yellow; IV, broken. Pronotum, length .47 mm, width at base 1.0 mm, fuscous brown. Mesonotum and scutellum fuscous brown. Dorsal surface clothed with recumbent, dusky to golden brown simple hairs, and intermixed with prostrate and appressed, silvery sericeous pubescence. Hemelytra pallid, subtranslucent to dusky, dark specimens with fuscous on clavus, apical half of corium, and the cuneus. Membrane uniformly dusky, or pale fuscous to brownish, veins pallid. Ventral surface fuscous brown, sides of thorax with silvery sericeous pubescence. Legs yellowish brown, tips of femora more yellowish; tibiae pallid, spines and spots at base brownish black; tarsi pallid, tips fuscous.

Female. Length 2.9 mm, width 1.3 mm. Head: width .90 mm, vertex .56 mm. Rostrum, length 1.0 mm, reaching upon hind coxae. Antennae: segment I, length .20 mm; II, .82 mm, cylindrical, more slender than segment I, pale brownish yellow; III, .58 mm; IV, .30 mm. Pronotum, length .44 mm, width at base 1.05 mm. More robust than the male but very similar in color and pubescence.

Holotype: ♂ Aug. 4, 1927, Billings, Montana (H. H. Knight). **Allotype:** ♀ taken with the type. **Paratypes:** 4 ♀ taken with the types.

Europiella stitti, new species

Allied to *montanae* but size smaller; head fuscous to black, vertex pallid; pronotum pallid, calli fuscous to black.

Female. Length 2.5 mm, width 1.2 mm. Head: width .73 mm, vertex .44 mm; fuscous to black, vertex pallid. Rostrum, length .64 mm, reaching upon hind coxae, brownish yellow. Antennae: segment I, length .17 mm, dusky yellow; II, .58 mm, subcylindrical, somewhat more slender on basal half, pale yellowish; III, .41 mm, pale yellowish; IV, .30 mm, dusky yellow. Pronotum, length .34 mm, width at base .88 mm; pallid to pale yellowish, calli remain fuscous to black. Mesonotum and scutellum fuscous, apical half of scutellum more pallid. Dorsal surface sparsely clothed with recumbent to suberect fuscous simple hairs, and intermixed with prostrate to appressed, silvery sericeous pubescence. Hemelytra subtranslucent, rather evenly shaded with dusky to pale fuscous;

cuneus mostly with recumbent, fuscous to black simple hairs; membrane mostly dusky pale brown, veins pallid. Ventral surface pallid to pale fuscous; venter fuscous to blackish, sides remain greenish yellow. Legs pale yellowish, coxae and dorsal half of hind femora fuscous, ventral half paler and with three or four fuscous spots, apical half with a few small fuscous dots. Tibiae pallid, spines black and with black spots at base; tarsi pallid, apex fuscous.

Holotype: ♀ Feb. 13, 1941, Gila Bend, Arizona (L. L. Stitt). **Paratypes:** 6 ♀ taken with the types.

Europiella albipubescens, new species

Distinguished from allied species by having only white pubescent hairs and silvery, sericeous pubescence.

Male. Length 3.5 mm, width 1.3 mm. Head: width .88 mm, vertex .49 mm; pallid, without marks. Antennae: segment I, length .23 mm, pallid; II, .92 mm, cylindrical, pallid, apex dusky; III, .54 mm, pale; IV, .30 mm, dusky. Rostrum, length .98 mm, reaching upon apex of middle coxae, pallid, apex black. Pronotum, length .51 mm, width at base 1.10 mm; pallid, disk and head clothed with suberect, pale hairs and intermixed with silvery, sericeous pubescence; a single fuscous bristle each side on anterior angle. Scutellum pallid, mesonotum pallid but becoming fuscous on middle. Hemelytra pallid, subtranslucent, without fuscous marks, clothed with pallid simple hairs intermixed with silvery, sericeous pubescence. Thorax pallid, mesosternum pale to fuscous. Legs pallid, hind femora with median and a subdorsal line of minute fuscous dots on anterior face, dots nearly obsolete on front and middle femora; tibiae pallid, spines brownish to fuscous, the fuscous dots at base of spines rather weak; tarsi pale, claws blackish. Venter pale to white, white pubescent; genital segment fuscous above on base of tergite; flagellum black, very large, exposed part subtriangular in shape.

Female. Length 3.4 mm, width 1.5 mm. Head: width .95 mm, vertex .54 mm. Antennae: segment I, length .21 mm; II, .85 mm, cylindrical, slightly more slender on basal half; III, .51 mm; IV, absent; pallid. Pronotum, length .54 mm, width at base 1.18 mm. More robust than the male, but very similar in color and pubescence.

Holotype: ♂ June 14, 1965, Area 401M, Nevada Test Site (D E. Beck, H. H. Knight & J. M. Merino). **Allotype:** ♀ same data as the type.

Paratypes: 32♂ ♀ taken with the types on *Chrysothamnus nauseous*. 35♂ ♀ June 18, 1965, Area 401M; 36♂ ♀ June 11, ♀ June 24, Area 16M; 17♂ ♀ June 12, 12♂ ♀ June 16, 15♂ ♀ June 17, Area 17M; 2♀ July 1, 1965, Area 17M, 1965, Nevada Test Site (D. E. Beck, H. H. Knight & J. M. Merino), mostly taken on *Chrysothamnus nauseous*, the host plant.

Europiella punctipes, new species

Allied to *sparsa* Van D. but may be separated by the longer second antennal segment, which in length exceeds the width of head across eyes; head and thorax never with black color as occurs with *sparsa*.

Male. Length 3.1 mm, width 1.2 mm. Head: width .74 mm, vertex .37 mm; pallid to white, no dark marks. Antennae: segment I, length .20 mm, pallid; II, .81 mm, cylindrical, pale to greenish, clothed with fine pale pubescence; III, .51 mm, pallid; IV, .27 mm, dusky. Rostrum, length .64 mm, just reaching to base of middle coxae, pale, apex black. Pronotum, length .44 mm, width at base .98 mm; pale greenish white, pubescence pale to silvery, including a prominent bristle set at each anterior angle of disk. Scutellum and mesonotum pale to greenish white. Dorsal surface including top of head, clothed with suberect, simple pale and fuscous hairs, intermixed with more appressed, white sericeous pubescence. Hemelytra subtranslucent, pallid to white, tinged with green in fresh specimens; veins white, membrane pale to dusky on apical half. Ventral surface pale to greenish, without the infuscations found in *sparsa*. Legs pallid to whitish; femora with fuscous spots, anterior aspect with three spots on ventral margin, also four or five fuscous spots along dorsal margin, median line with a series of smaller spots, and subapical area with a few jumbled smaller dots; tibia pallid, with black spots at base of fuscous spines, without knee spot; tarsi pale, claws blackish. Venter pallid to greenish white; genital claspers small, white, tip of flagellum slender, black in color.

Female: Length 2.7 mm, width 1.2 mm. Head: width .73 mm, vertex .41 mm. Antennae: segment I, length .20 mm; II, .78 mm, cylindrical, slightly more slender near base; III, broken. Pronotum, length .41 mm, width at base .92 mm. Very similar to the male in color and pubescence.

Holotype: ♂ June 23, 1965, Area 19M, Nevada Test Site (H. H. Knight & J. M. Merino).

Allotype: ♀ July 7, 1965, Area 18M, Nevada Test Site (D. E. Beck & J. M. Merino). **Paratypes:** ♂ June 23, Area 19M; ♂ June 23, 1965, Area 18M (H. H. Knight & J. M. Merino); 4♂ 1♀ July 7, 1965, Area 18M (D. E. Beck & J. M. Merino); ♂ July 21, 1965, Area 410M (D. E. Beck & J. M. Merino), at black light, all others taken on *Atriplex canescens*, which appears to be the host plant; 3♂ June 13, 1965, Area CM (D. E. Beck & H. H. Knight); 2♂ April 20, 1961, Area 6DA, on *Atriplex canescens*, Nevada Test Site.

Europiella sparsa Van Duzee

Europiella sparsa Van Duzee, 1918:305.

I have determined the following material from the Nevada Test Site: Area 401M, ♀ June 14, 2♂ 2♀ June 18, 37♂ ♀ June 20, 18♂ ♀ June 22, 1965; Area 5M, 22♂ ♀ June 12, 1965, Area 16M, 9♂ ♀ June 11, ♀ Aug. 19, 45♂ ♀ June 24, 1965; Area 17M, ♂ 4♀ June 16, ♀ Aug. 5, ♀ Aug. 25, 1965; Area 18M, 28♂ ♀ June 23, 7♂ ♀ July 7, 1965; Area 19M, 3♂ 2♀ June 23, 1965; Area CM, ♂ 3♀ June 10, ♀ June 13, 1965; Area TE, ♀ June 10, 1965; Area 6DA, 2♂ 4♀ April 20, 1961, from Berlese funnel; 3♂ 1♀ April 21, 1961; Area CE, ♀ July 21, 1962, at black light; Area 6DD, ♀ Oct. 24, 1960, from Berlese funnel; ♀ April 24, 1961, on *Atriplex canescens*; Area 18M, ♀ July 22, 1965, at black light. Most of the specimens were collected on *Atriplex canescens*, but a few were beaten from other species of *Atriplex*.

This species is also known from California, Arizona, Colorado, and Utah.

Genus *Psallus* Fieber

Psallus merinoi, new species

Allied to *carneatus* Kngt., about the same color, or more reddish; femora with rows of fuscous dots; length of second antennal segment exceeding width of head by space about equal to thickness of segment I.

Female. Length 3.7 mm, width 1.5 mm. Head: width .83 mm, vertex .44 mm; yellowish to dusky salmon, area each side of frons with dusky transverse lines. Rostrum, length 1.4 mm, reaching upon posterior trochanters, yellowish, dusky on apex, with two black subapical bristles, each with fuscous spot at base; II, .92 mm, yellowish to dusky, blackish on base; cylindrical, slightly thicker on apical half; III, .61 mm, dusky yellow; IV, .27 mm, fuscous. Pronotum, length .61 mm, width at base 1.26 mm;

disk yellowish to pink, calli more yellowish; propleura pallid on margins, dorsal half pink. Dorsal surface clothed with recumbent, yellowish to fuscous simple hairs, and intermixed with more appressed, silvery to yellowish sericeous pubescence; also with a few more erect, black bristles on vertex and anterior margins of pronotum. Mesonotum yellowish, scutellum pink. Hemelytra rather uniformly salmon red, embolium pallid; base of cuneus white, outer margin and apex narrowly pallid to white; membrane fuscous, veins dusky, white on apex of smaller areole. Ventral surface pallid to dusky yellow. Legs pallid, femora with longitudinal rows of fuscous dots, hind pair with row on median line of anterior aspect, confused by irregular dots near apex; ventral margin with six dots on apical half; dorsal margin with fuscous line on basal half, near apex with geminate spots bearing two black bristles; tibiae pallid, set with strong black spines, each with black spots at base, knees fuscous to black; tarsi pallid, apical segment and claws blackish.

Holotype: ♀ July 18, 1965, on bench of Charleston Canyon near Indian Springs, Nevada (D E. Beck — J. M. Merino).

This species is named for J. M. Merino, graduate student at Brigham Young University, who did considerable collecting, drove the automotive equipment, acted as guide, and did everything possible to make my work pleasant and satisfactory while at the test site.

Psallus atriplicis, new species

Allied to *fuscopunctatus* Kngt., but distinguished by the shorter rostrum, also by the uniformly pallid antennae.

Male. Length 3.9 mm, width 1.56 mm. Head: width .85 mm, vertex .41 mm; pallid. Rostrum, length 1.15 mm, just reaching upon middle of hind coxae, pallid, apex blackish. Antennae: segment I, length .24 mm, pallid; II, 1.05 mm, cylindrical, pallid; III, .60 mm, pallid; IV, .34 mm, pale. Pronotum, length .61 mm, width at base 1.22 mm; pallid. Mesonotum and scutellum, pallid. Hemelytra pallid, sprinkled with small setigerous fuscous dots, embolium and cuneus included; membrane and veins milky white in color, subtranslucent. Dorsal surface clothed with suberect, pale pubescent hairs, somewhat longer on edge of embolium, and intermixed with silvery, sericeous pubescence. Legs pallid, femora marked with irregularly spaced, fuscous dots; tibiae with pallid spines but each with a fuscous dot at base, tarsi pallid, claws black,

with typical small pseudarolia. Genital segment pallid, claspers typical of the genus.

Female: Length 3.0 mm, width 1.5 mm. Head: width .85 mm, vertex .46 mm. Antennae: segment I, length .24 mm, pallid; II, .75 mm, cylindrical, thickness only half that of segment I, pallid; III, .50 mm; IV, .30 mm. Pronotum, length .54 mm, width at base 1.2 mm. More robust than the male but color and pubescence very similar.

Holotype: ♂ June 24, 1965, Area 16M, Nevada Test Site (H. H. Knight & J. M. Merino). **Allotype:** ♀ taken with the type. **Paratypes:** 2 ♂ taken with the types on *Atriplex canescens*, which is the host plant of the species. ♀ June 20, 1965, Area 401M, Nevada Test Site (H. H. Knight & J. M. Merino).

Psallus purshiae, new species

Allied to *cercocarpicola* Kngt., but differs in the shorter second antennal segment, and the amber brown femora; tibiae uniformly brownish black, spines black, with no trace of white between the spines as found in *nigerrimus* Van Duzee.

Male. Length 3.4 mm, width 1.4 mm. Head: width .78 mm, vertex .37 mm; black. Antennae: segment I, length .24 mm, black; II, .82 mm, cylindrical, thickness slightly less than segment I, black, with fine, short black pubescence; III, .51 mm, brownish black, just reaching upon apex of middle coxae. Pronotum, length .61 mm, width at base 1.22 mm. Dorsal surface and body uniformly black. Membrane fuscous, veins, within areoles and bordering veins darker fuscous; veins black, except bordering apex of smaller areole, nearly clear. Dorsal surface and sides of body, clothed with recumbent, yellowish to brown, simple hairs, and intermixed with more appressed silvery white, sericeous pubescence. Legs yellowish to amber brown; tibiae brownish black, set with strong black spines, but no indication of paler or white on dorsal surface between spines, as is true of some related species. Hind femora with a row of obscure, darker points on anterior aspect. Genital segment and claspers rather similar in form to allied species of *Psallus*.

Female. Length 3.4 mm, width 1.5 mm. Head: width .78 mm, vertex .41 mm. Antennae: segment I, length .21 mm; II, .88 mm, cylindrical, but more slender on basal half, thickness little more than half that of segment I, black; III, .52 mm; IV, .27 mm. Pronotum, length .64 mm, width at base 1.25 mm. Slightly

more robust than the male, but very similar in color and pubescence.

Holotype: ♂ June 17, 1965, Area 17M, Nevada Test Site (H. H. Knight & J. M. Merino), taken on *Purshia tridentata*, which appears to

be the host plant. **Allotype:** ♀ same data as the type. **Paratypes:** ♂ June 20, 1965, Area 401M; ♂ June 22, 2♂ June 24, 1965, Area 19M, Nevada Test Site (H. H. Knight & J. M. Merino).

Genus *Phymatopsallus* Knight

Key to the Species

- 1. Dorsal surface with dots and spots 2
Dorsal surface without dots or spots; color apple green; length of second antennal segment greater than width of head *prosopidis*, n. sp.
- 2. Dorsal spots fuscous or blackish 4
Dorsal spots fulvous or reddish 3
- 3. Length of second antennal segment subequal to width of head; left clasper of male with two spines on apex of basal prong *texanus* Kngt.
Length of second antennal segment distinctly greater than width of head; left clasper of male with two dorsal prongs *pantherinus* Van D.
- 4. With a single row of strong fuscous dots along membrane margin of cuneus and paracuneus; left clasper of male with two widely spaced prongs on dorsal margin (Fig. 74) *ribesi*, n. sp.
Without a distinct row of fuscous spots along membrane margin of cuneus and paracuneus; with but one dorsal prong on base of male left clasper, and apex of prong with two small subequal spines *fuscipunctatus* Kngt.

Phymatopsallus prosopidis, new species

Fig. 73

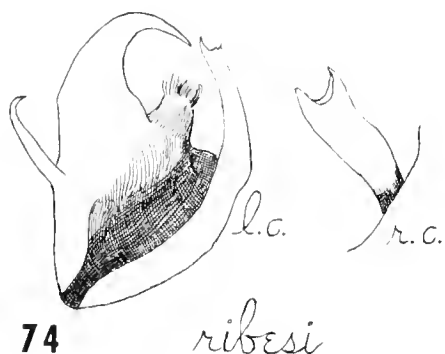
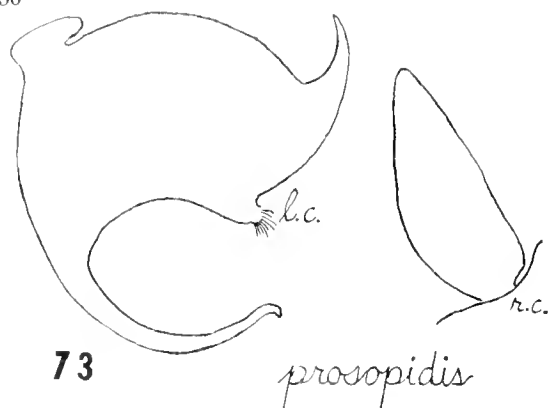
In the key to species of *Phymatopsallus* Knight (1964) this species runs nearest to *rinconae*, but it may be separated by the male claspers; basal prong of left clasper shorter and more vertical in position than *rinconae* (Fig. 73).

Male. Length 2.8 mm, width 1.0 mm. Head: width .61 mm, vertex .24 mm; green to yellowish. Antennae: segment I, length .18 mm; II, .72 mm, cylindrical, thickness just slightly less than segment I, dusky yellow, micropubescence fuscous; III, missing. Rostrum, length .68 mm, just reaching to base of middle coxae. Pronotum, length .41 mm, width at base .90 mm. Color apple green, corium subtranslucent, no spots or shades. Dorsal surface clothed with suberect, simple pale pubescence. Membrane pale, largely filled with conspurcate fuscous dots and reticulations; veins and cuneus apple green. Legs pallid to greenish, hind femora with a few minute fuscous dots; tibiae pale, spines fuscous and with

fuscous spot at base of each, becoming obsolete near apex. Ventral surface pallid to green; genital claspers distinctive of the species (Fig. 73).

Female. Length 2.7 mm, width 1.1 mm. Head: width .61 mm, vertex .27 mm. Antennae: segment I, length .17 mm; II, .71 mm, cylindrical, more slender near base, thickness not equal to segment I, greenish yellow; III, .36 mm, yellowish; IV, .27 mm, dusky. Rostrum, length .78 mm, reaching to base of middle coxae. Pronotum, length .38 mm, width at base .88 mm. Coloration and pubescence similar to the male.

Holotype: ♂ June 13, 1965, Area CM, Nevada Test Site (D E. Beck & H. H. Knight). **Allotype:** ♀ taken with the type. **Paratypes:** 10♂ 6♀ June 13, 1965, Area CM, collected with the types on *Prosopis juliflora*, from two trees growing near site of old abandoned water troughs at Cane Springs. Botanists say these two trees are all they have found at the test site, and further state that the trees were "probably planted. Apparently not reproducing." The nearest native stands of mesquite are said to be



Figs. 73-74. ♂ claspers. 73, *Phymatopsallus prosopidis*; 74, *P. ribesi*.

some 20 miles to the east and south of Cane Springs. Just how the species of bugs reached these isolated trees is a matter of great interest. Also, how long the bugs have bred in isolation on these trees is of greater interest, for here we have a limited inbreeding population that could demonstrate some effects of isolated inbreeding of a species. A desirable project now would be to collect from native stands of *Prosopis juliflora* to see if the two species of plant bugs occur in other areas.

In some old material I have found additional specimens as follows: 2♂ 4♀ April 28, 1939, Yuma County, Arizona (L. L. Stitt), swept from *Prosopis*.

Phymatopsallus ribesi, new species

Fig. 74

In my key to species of *Phymatopsallus* Knight (1964) this species runs in the couplet with *fuscipunctatus* Knight, from which it may be distinguished by two long and widely spaced dorsal prongs on the left clasper (Fig. 74); also by the strong single row of fuscous dots along inner margin of cuneus and paracuneus.

Male. Length 2.9 mm, width 1.2 mm. Head: width .63 mm, vertex .28 mm. Antennae: segment I, length .17 mm, pale to dusky; II, .75 mm, cylindrical, thickness equal to segment I, pale yellowish; III, .37 mm, dusky; IV, .20 mm, dusky. Rostrum, length .95 mm, reaching upon posterior trochanters. Pronotum, length .42 mm, width at base 1.0 mm; calli indistinct, disk with a few fuscous dots. Basic color pale to greenish yellow, dorsal surface including scutellum and hemelytra, with numerous setigerous fuscous dots; inner margin of cuneus and paracuneus, set with a line of 9 or 10 distinct fuscous dots. Membrane conspurcate with small and some larger fuscous dots and spots, a large spot behind cuneus, and apical half of areoles fuscous; veins mostly pallid. Dorsal surface clothed with suberect, simple, pale pubescent hairs; hairs longer on margins of pronotal disk, and on embolium. Ventral surface pallid to greenish. Legs pallid, hind femora with 8 or 9 dots on apical half of anterior face, median line with several minute dots; tibiae pallid, spines fuscous, each with small fuscous dot at base. Genital segment and distinct tubercle pallid; claspers distinctive of the species (Fig. 74).

Female. Length 2.8 mm, width 1.2 mm. Head: width .61 mm, vertex .30 mm. Antennae: segment I, length .17 mm; II, .71 mm, cylindrical, thickness not equal to segment I; III, .30 mm; IV, .27 mm. Rostrum, length 1.0 mm, reaching upon posterior trochanters. Pronotum, length .37 mm, width at base .93 mm. Pubescence and coloration very similar to the male.

Holotype: ♂ Aug. 11, 1965, Area 12M, Nevada Test Site (J. M. Merino). **Allotype:** ♀ same data as the type. **Paratypes:** Area 12M 5♂ Aug. 11, 6♂ 1♀ Aug. 13, ♂ 2♀ Aug. 24, 1965, Nevada Test Site (J. M. Merino), all collected on *Ribes*, which is the host plant.

Phymatopsallus pantherinus Van Duzee

Psallus pantherinus Van Duzee, 1917:279.

Phymatopsallus pantherinus Knight, 1964:138, Fig. 8.

Known from Lake and Sonoma Counties, California.

Phymatopsallus texanus Knight

Phymatopsallus texanus Knight, 1964:134, Fig. 9.

Allied to *pantherinus* (Van D.), but distinguished in the key; length of antennal segment II subequal to width of head.

Known from western Texas.

Phymatopsallus fuscipunctatus Knight

Phymatopsallus fuscipunctatus Knight, 1964:135, Fig. 12.

In the key this species runs in the couplet

with *ribesi* from which it may be distinguished by the male claspers, also by lack of fuscous spots on cuneus and paracuneus.

Known from Utah County, Utah, and from Idaho.

Genus *Lepidopsallus* Knight
Key to the Species

1. Length of second antennal segment not equal to width of head 2

Length of second antennal segment subequal to, or greater than width of head 9
2. Rostrum reaching beyond hind coxae 8

Rostrum not reaching beyond hind coxae 3
3. Rostrum reaching upon apex of hind coxae 6

Rostrum just reaching apex of middle coxae, or base of hind coxae 4
4. Thickness of second antennal segment subequal to thickness of segment I 5

Thickness of second antennal segment less than segment I; segment I black, segment II pale to reddish brown; length 2.9-3.2 mm *rubidus* Uhler
5. Length of antennal segment II equal to twice the width of vertex; length 3.4 mm *arizonae*, n. sp.

Length of antennal segment II not equal to twice the width of vertex; length 2.5 mm *tuthilli*, n. sp.
6. Legs reddish brown to black 7

Legs and antennae uniformly pallid; length 2.5 mm *nicholi*, n. sp.
7. Antennae pallid; length 2.6 mm *ovatus* Kngt.

Antennae black; length 2.7 mm *californicus*, n. sp.
8. Rostrum reaching to base of genital segment (♂), or upon ovipositor (♀); antennae black, segment II pale; length 2.2-2.4 mm *pini*, n. sp.

Rostrum reaching to middle of venter; first antennal segment black, segment II pallid; length 2.8-3.3 mm *hesperus*, n. sp.
9. Rostrum reaching upon middle of venter; length of second antennal segment greater than width of head (♂), or subequal (♀); length 4.0-4.3 mm *longirostris*, n. sp.

Rostrum only reaching to apex of middle coxae; second antennal segment subequal to width of head (♂ & ♀); length 4.0 mm *monticola*, n. sp.

Lepidopsallus ovatus Knight

Lepidopsallus ovatus Knight, 1926:227, n. sp.

This species was described from Tucson, Arizona, and I have other specimens from Grand View, Grand Canyon, and Williams. The species also occurs in California: 2♂ 2♀ April 14, 1935,

Santiago Canyon (E. L. Paddock), taken on *Quercus agrifolia* where it was breeding.

Lepidopsallus rubidus (Uhler)

Sthenarus rubidus Uhler, 1895:41, n. sp.

Lepidopsallus rubidus Knight, 1941: 47, key.

This species is known from California, Utah, Washington, Idaho, Colorado, Texas and states eastward. Known host plants are various species of willow, *Salix*.

Lepidopsallus arizonae, new species

Allied to *rubidus* Uhler, but distinguished by having thicker antennal segments; thickness of segment II subequal to thickness of segment I.

Male. Length 3.2 mm, width 1.4 mm. Head: width .81 mm, vertex .37 mm, black. Rostrum, length 1.09 mm, reaching upon apex of middle coxae, brownish black. Antennae: segment I, length .20 mm, black; II, .75 mm, thickness subequal to segment I, black, thickly clothed with suberect brown to black hairs; III, .41 mm, black; IV, .28 mm, brownish black. Pronotum, length .64 mm, width at base 1.19 mm, uniformly black, disk sparsely clothed with suberect brownish black hairs, intermixed with appressed, flat, silvery white scalelike hairs, the silvery scales thickly cover propleura and sides of thorax. Scutellum and mesonotum black. Hemelytra brownish black, covered like the pronotum, with suberect, brownish black pubescent hairs, and thickly intermixed with appressed, silvery white scalelike pubescence. Membrane uniformly dark fuscous, veins paler, dusky brown. Ventral surface brownish black, thickly covered with appressed, silvery scalelike hairs, intermixed with recumbent brownish simple hairs. Legs uniformly brownish black, femora bearing some silvery scalelike hairs.

Female. Length 2.7 mm, width 1.5 mm. Head: width .82 mm, vertex .42 mm. Rostrum, length 1.05 mm, reaching upon trochanters of middle legs. Antennae: segment I, length .19 mm; II, .58 mm, subcylindrical, more slender near base, apical half subequal in thickness to segment I, black; III, .30 mm, black; IV, .22 mm, fuscous. Pronotum, length .58 mm, width at base 1.18 mm. Shorter and more robust than the male, but very similar in color and pubescence.

Holotype: ♂ July 27, 1917, alt. 9000 ft, Mt. Lemon, Santa Catalina Mts., Arizona (H. H. Knight). **Allotype:** ♀ taken with the type. **Paratypes:** 3♂ 5♀ taken with the types, beating on pines. ♂ 4♀ July 29, 1905; ♂ ♀ July 12, 1916, Huachuca Mts., Arizona (H. G. Barber).

Lepidopsallus tuthilli, new species

Runs in the couplet with *arizonae* from which it differs by the shorter second antennal segment.

Male. Length 2.5 mm, width 1.3 mm. Head: width .87 mm, vertex .38 mm; black. Rostrum, length 1.02 mm, reaching upon posterior coxae, black. Antennae: segment I, length .17 mm, black; II, .54 mm, more slender on basal half, tapering slightly thicker to apex, thickness subequal to segment I, black; III, .27 mm, slender, fuscous, pale at base; IV, .24 mm, fuscous. Pronotum, length .52 mm, width at base .98 mm; brownish black, disk and the head clothed with appressed, silvery sericeous to scalelike hairs, intermixed with recumbent yellowish simple hairs. Hemelytra and scutellum brownish black, rather thickly clothed with appressed silvery sericeous and scalelike pubescence, intermixed with yellowish to brown simple hairs, those along costal margin longer and bristlelike. Membrane fuscous brown, veins paler. Ventral surface reddish brown to dark brown, ostiolar peritreme white; clothed with appressed, silvery sericeous pubescence like the dorsal surface. Legs reddish brown to dark brown; tibiae paler on apical half, spines dark but without black spots at base.

Holotype: ♂ July 22, 1940, Creede, Colorado (L. D. Tuthill).

Lepidopsallus nicholi, new species

Allied to *ovatus* Kngt., but distinguished by the pale yellowish brown color, pallid legs and antennae.

Female. Length 2.6 mm, width 1.4 mm. Head: width .72 mm, vertex .37 mm; yellowish brown. Rostrum, length 1.0 mm, reaching upon apex of hind coxae, yellowish, darker on base and apex. Antennae: segment I, length .14 mm, pallid; II, .54 mm, pale yellowish, cylindrical, slightly thicker on apical half but not equal to thickness of segment I; III, .28 mm, pale; IV, .24 mm, pale to dusky. Pronotum, length .54 mm, width at base 1.09 mm; disk pale reddish brown, clothed with recumbent to suberect, yellowish to golden simple hairs, intermixed with appressed, silvery scalelike hairs. Scutellum and mesonotum pallid to yellowish, with a touch of reddish brown. Hemelytra pallid to yellowish, subtranslucent, apical half tinted and shaded with reddish brown; cuneus reddish to red, deeper red on apex and outer margin. Ventral surface yellowish. Mesosternum fuscous. Venter pale yellowish, more fuscous brown on sides at base, apical segments reddish brown. Legs pallid, tibial spines black, without spots at base.

Male. Length 2.9 mm, width 1.3 mm. Head: width .71 mm, vertex .30 mm. Rostrum, length

.92 mm, reaching upon apex of hind coxae. Antennae: segment I, length .15 mm, pale yellow; II, .66 mm, slender on basal third, tapering thicker on apical half, subequal in thickness to segment I; III, .28 mm, yellowish; IV, .23 mm, dusky. Pronotum, length .52 mm, width at base 1.10 mm. More slender than the female, with head and calli chiefly fuscous, but pubescence very similar.

Holotype: ♀ May 20, 1928, alt. 5000 ft, Empire Mts., Arizona (A. A. Nichol), taken on *Quercus emoryi*. **Allotype:** ♂ taken with the type. **Paratypes:** 4♂ 11♀ taken with the types on *Quercus emoryi*, where the species was breeding. ♂ June 20, 1928, alt. 6200 ft, Chiricahua Mts., Arizona (A. A. Nichol). 2♀ May 12, 1929, Tucson, Arizona (E. D. Ball).

Lepidopsallus californicus, new species

In the key this species runs in the couplet with *ovatus* Kngt., from which it may be separated by the black antennae; length of antennal segment II not equal to width of vertex.

Male. Length 2.4 mm, width 1.15 mm. Head: width .88 mm, vertex .47 mm; black. Rostrum, length .82 mm, reaching upon apex of hind coxae. Antennae: segment I, length .17 mm, black; II, .44 mm, cylindrical, thickness subequal to segment I, black; III, .27 mm, black; IV, .23 mm, black. Pronotum, length .41 mm, width at base .92 mm; black. Dorsal surface black, thickly clothed with appressed, flat, white scalelike hairs, intermixed with recumbent to suberect, brownish black pubescent hairs. Membrane pale fuscous, with a few white scalelike hairs on basal half. Ventral surface brownish black, thickly covered with appressed, white scalelike hairs. Legs brownish black, also bearing many white scalelike hairs.

Female. Length 2.6 mm, width 1.2 mm. Head: width .92 mm, vertex .52 mm; black. Rostrum, length .92 mm, reaching upon apex of hind coxae. Antennae: segment I, length .18 mm; II, .62 mm; III, .28 mm; IV, .24 mm. Pronotum, length .44 mm, width at base .96 mm. Slightly more robust than the male, but very similar in color and pubescence.

Holotype: ♂ June 20, 1926, Fresno, California (C. J. Drake). **Allotype:** ♀ same data as the type. **Paratypes:** 3♂ 4♀ taken with the types. ♀ May 21, 1926, Griffith Park, Los Angeles, California (L. J. Muchmore).

Lepidopsallus pini, new species

In the key this species runs in the couplet with *hesperus*, from which it may be separated by the longer rostrum which in the male reaches base of genital segment.

Male. Length 2.3 mm, width .96 mm. Head: width .64 mm, vertex .28 mm; brownish black. Rostrum, length 1.22 mm, reaching upon base of genital segment. Antennae: segment I, length .14 mm, black; II, .44 mm, cylindrical, thickness subequal to segment I, pale yellowish, fuscous on base and apex; III, .24 mm, fuscous; IV, .20 mm, fuscous. Pronotum, length .37 mm, width at base .78 mm. Dorsal surface brownish black, clothed with recumbent, simple brown hairs, rather thickly intermixed with appressed, flat, silvery pubescence. Membrane uniformly pale fuscous. Ventral surface brownish black, clothed with silvery, scalelike hairs, similar to that on the dorsum; venter shining in some angles of light. Legs dark fuscous brown, tibiae slightly paler, spines black.

Female. Length 2.4 mm, width .98 mm. Head: width .64 mm, vertex .28 mm. Rostrum, length 1.2 mm, reaching to base of first genital segment. Antennae: segment I, length .15 mm; II, .44 mm, pale, fuscous on base; III, .24 mm, fuscous; IV, .20 mm. Pronotum, length .40 mm, width at base .85 mm.

Holotype: ♂ Aug. 10, 1925, Fort Garland, Colorado (H. H. Knight). **Allotype:** ♀ taken with the type. **Paratypes:** 2♂ 6♀ taken with the types on *Pinus edulis*, where the species was breeding. 3♂ June 24, 1925, alt. 7000 ft., Williams, Arizona (A. A. Nichol). Record for the Nevada Test Site: ♀ July 24, 1962, Area 12M, taken on *Pinus monophylla*.

Lepidopsallus hesperus, new species

Runs in the key to the couplet with *pini*, but differs in the shorter rostrum which reaches only to middle of venter; size larger.

Male. Length 2.8 mm, width 1.26 mm. Head: width .75 mm, vertex .34 mm; black. Rostrum, length 1.36 mm, reaching upon sixth ventral segment, brownish black. Antennae: segment I, length .16 mm, black; II, .63 mm, pale yellowish, subcylindrical, slightly more slender near base, apical half subequal to thickness of segment I; III, .40 mm, pale fuscous; IV, .32 mm, dusky yellow. Pronotum, length .47 mm, width at base 1.02 mm; disk and whole dorsal surface brownish black. Dorsal surface brownish black, clothed

with recumbent to suberect, golden brown simple hairs, and rather thickly intermixed with closely appressed, flat, white scalelike pubescence. Membrane and veins pale fuscous. Ventral surface dark reddish brown to brownish black, clothed with pubescence like the dorsal surface. Legs dark reddish brown, tibiae pale to yellowish, spines dark brown. Venter dark reddish brown.

Female. Length 2.7 mm, width 1.3 mm. Head: width .74 mm, vertex .34 mm. Rostrum, reaching upon first genital segment. Antennae: segment I, length .14 mm, brownish black; II, .64 mm, subcylindrical, more slender on basal half, thickness on apex subequal to segment I, uniformly yellowish. Pronotum, length .50 mm, width at base .98 mm. Slightly more robust than the male, but very similar in color and pubescence.

Holotype: ♂ Aug. 6, 1931, Big Springs, Idaho (H. H. Knight). **Allotype:** ♀ same data as the type. **Paratypes:** ♂ 3 ♀ taken with the types on *Pinus*. 2♂ 1♀ Aug. 8, 1937, Lake Tahoe, California (C. J. Drake — F. Andre). ♀ Aug. 15, 1927, Shoshone National Forest, Wyoming (H. H. Knight).

Lepidopsallus longirostris, new species

Allied to *monticola* by having length of second antennal segment exceeding width of head; distinguished by the long rostrum which reaches upon seventh ventral segment.

Male. Length 3.3 mm, width 1.36 mm. Head: width .73 mm, vertex .34 mm. Rostrum, length 1.7 mm, reaching upon seventh ventral segment, brownish black. Antennae: segment I, length .19 mm, black; II, .78 mm, pale yellowish, cylindrical, thickness subequal to that of segment I; III, .51 mm, dusky; IV, .27 mm, dusky. Pronotum, length .51 mm, width at base 1.09 mm. Head and body uniformly brownish black; dorsal surface clothed with recumbent to suberect, golden brown simple hairs, and thickly intermixed with appressed, silvery white, oval scalelike hairs; no scales on side of body. Membrane and veins uniformly infuscated. Ventral surface uniformly brownish black, moderately shining. Legs brownish black, tibiae and tips of femora pale yellowish brown; tibial spines brownish black, devoid of spots.

Female. Length 3.3 mm, width 1.46 mm. Head: width .74 mm, vertex .34 mm. Rostrum, length 1.76 mm, reaching to base of first genital segment. Antennae: segment I, length .20 mm, black; II, .78 mm, cylindrical, slightly more slender

on basal half, thickness near apex subequal to that of segment I, pale yellowish; III, .47 mm, yellowish; IV, .34 mm, dusky. Pronotum, length .51 mm, width at base 1.14 mm. Very similar to the male in color and pubescence.

Holotype: ♂ Aug. 20, 1925, Pingree Park, Colorado (H. H. Knight). **Allotype:** ♀ same data as the type. **Paratypes:** 5♂ 13♀ taken with the types, beating on *Pinus*. ♂ July 29, 1931, Medicine Bow Mts., Wyoming (H. H. Knight). 4♂ 4♀ Aug. 9, 1929, San Francisco Mts., Arizona (E. D. Ball).

Lepidopsallus monticola, new species

In the key this species runs in the couplet with *longirostris*, but may be distinguished by the short rostrum which only reaches upon apex of middle coxae; length of second antennal segment subequal to width of head in both sexes.

Male. Length 4.0 mm, width 1.7 mm. Head: width .88 mm, vertex .41 mm. Rostrum, length 1.46 mm, reaching upon apex of middle coxae. Antennae: segment I, length .20 mm, black; II, .90 mm, black, cylindrical, thickness subequal to that of segment I; III, .40 mm; IV, .28 mm, black. Pronotum, length .58 mm, width at base 1.4 mm. Dorsal surface black, paler at base of corium, cuneus and edge of embolium tinted reddish. Dorsal surface clothed with recumbent to suberect, golden brown simple pubescence, and intermixed with appressed, silvery white scalelike pubescence. Membrane uniformly fuscous brown, veins pale to yellowish. Ventral surface nearly black, clothed with silvery white, scalelike pubescence. Legs brownish black, tips of femora paler, tarsi pale to fuscous brown.

Female. Length 3.6 mm, width 1.8 mm. Head: width .85 mm, vertex .44 mm. Rostrum, length 1.3 mm, reaching upon apex of middle coxae. Antennae: segment I, length .22 mm, black; II, .81 mm, black, more slender on basal half, thickness near apex subequal to that of segment I; III, .34 mm, black; IV, .28 mm, fuscous. Pronotum, length .68 mm, width at base 1.38 mm. Cuneus and apical half of embolium distinctly red, otherwise the coloration and pubescence very similar to the male.

Holotype: ♂ Aug. 9, 1925, Veta Pass, Colorado (H. H. Knight). **Allotype:** ♀ taken with the type. **Paratypes:** 20♂ 23♀ taken with the types on *Pinus*. 3♂ 5♀ July 26, 1917, alt. 7800 ft, Sabino Canyon, Santa Catalina Mts. (H. H. Knight), taken on *Pinus*; ♂ 4♀ July 16, 2♀ July 17, 1917, Bonita (H. H. Knight); ♂ 3♀

July 27, 1917, alt. 9000 ft, Mt. Lemon, Santa Catalina Mts. (H. H. Knight); ♂ ♀ July 5, 1924, Rincon Mts.; ♀ June 20, 1928, alt. 6200 ft, Chiricahua Mts.; 3♂ June 15, 1924, alt. 7000 ft, Santa Rita Mts. (A. A. Nichol), on *Robinia*; 3♂ 3♀ July 31, 1941, Alpine, Arizona (L. L. Stitt).

Genus *Pseudatomoscelis* Poppius

Pseudatomoscelis seriatus (Reuter)

Fig. 75

Atomoscelis seriatus Reuter, 1876:91.

Pseudatomoscelis seriatus Poppius, 1911:86.

Psallus seriatus Van Duzee, 1916:46.

Psallus seriatus Knight, 1926:106.

Psallus seriatus Knight, 1941:45, Fig. 89.

I am convinced this species is not congeneric with the type of *Psallus* Fieb., so the generic name *Pseudatomoscelis* Poppius must prevail.

A single male specimen was collected at the test site, Area CM, Aug. 5, 1965 (J. M. Merino), at black light.

This species is known as the "cotton flea hopper," a common name used by the writer (Knight, 1926). It is known from Florida to Texas, Arizona and southern California; it ranges northward in limited numbers through Utah, Colorado, Nebraska, Minnesota, Illinois, Kentucky, North Carolina, and New Jersey. The preferred host plants of this mirid bug are various species of *Croton* from which it moves to

cultivated cotton. It ranks next to the cotton boll weevil as a pest of cotton.

Genus *Reuteroscopus* Kirkaldy

Reuteroscopus dreisbachi Knight

Reuteroscopus dreisbachi Knight, 1965:107.

This species is known from Douglas, San Simon, Tombstone, and Molino Basin near Tucson, all in Arizona, and seems a likely species to reach Nevada. Four other species of the genus

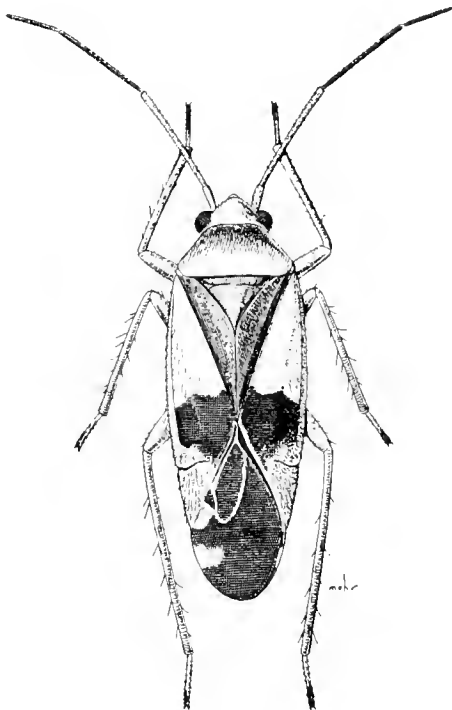


Fig. 76. *Reuteroscopus ornatus*, ♀.

are known from Arizona, but as yet I have not seen a specimen of *Reuteroscopus* taken in California, Nevada, or Utah.

Ankylotylus, new genus

Keys out in the same couplet with *Reuteroscopus*, but distinguished by the vertical head, and by having the clypeus sharply bent at middle, so that the apical half forms a nearly horizontal line; as viewed from the side, the ventral half of head appearing broad and square in outline. Pseudarolia small, not extending beyond middle of claw. Rostrum short, only reaching upon middle coxae. Antennae slender, second segment just equal to width of pronotum at base. Head above, pronotal disk and the calli, covered with appressed, silvery, squamose pu-

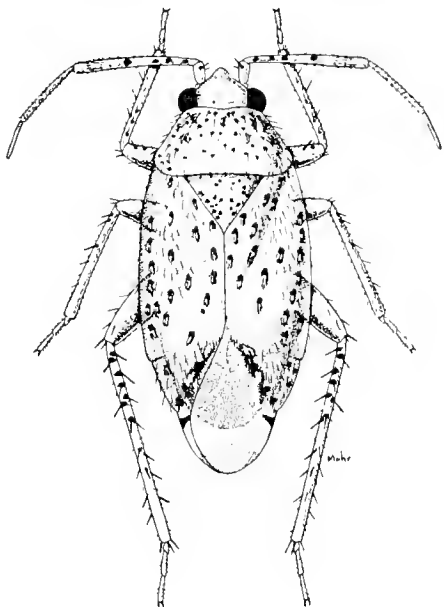


Fig. 75. *Pseudatomoscelis seriatus*, ♀.

bescence; scutellum and hemelytra more sparsely covered with sericeous pubescence, and intermixed with suberect, simple pubescence. Hemelytra white, subtranslucent, membrane and veins pallid. Legs and tibial spines pallid, without dots or spots. Type of the genus: *Ankylotylus pallipes*, new species.

Ankylotylus pallipes, new species

Fig. 77

Male. Length 4.1 mm, width 1.4 mm. Head: width .85 mm, vertex .37 mm; pallid to yellowish; clypeus sharply bent at middle, apical half pointing posteriorly; vertex and frons with appressed, silvery, sericeous pubescence; eyes rather large, prominent, color brown. Rostrum, length .68 mm, reaching upon base of middle coxae, yellowish, apex blackish. Antennae: segment I, length .20 mm, thickness .07 mm, yellow; II, 1.12 mm, cylindrical, slightly thicker (.05 mm.) on apical half, pale to yellowish; III, .68 mm, fuscous; IV, .37 mm. Pronotum, length .51 mm, width at base 1.12 mm; calli well defined

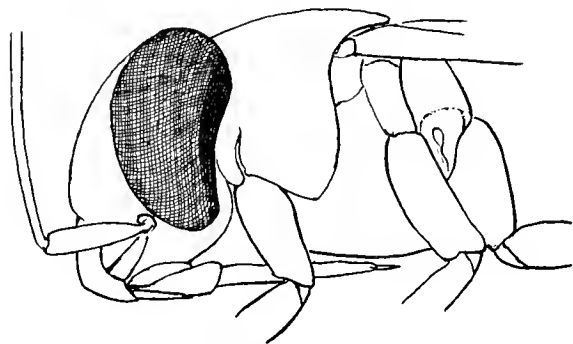


Fig. 77. *Ankylotylus pallipes*, head and thorax.

by impressed line on edges, but obscured by matted, silvery, sericeous pubescence, disk more sparsely clothed on basal half; disk fuscous, lateral margins pale yellowish, calli dark fuscous; lateral margins moderately sulcate, edge well defined, turned sharply down to meet the pallid propleura. Mesoscutum moderately exposed, yellow, fuscous on middle. Scutellum pale dusky brown, paler on apex; clothed with silvery, sericeous pubescence.

Hemelytra uniformly pallid, subtranslucent; clothed with moderately dense, appressed, silvery sericeous pubescence, sparsely intermixed with more erect, simple, pale pubescent hairs. Mesosternum fuscous, epimera and pleura yellow. Legs yellow, tibiae more pallid, set with rather short pallid spines, not punctate; tarsi dusky. Venter pallid to yellowish; genital segment and claspers very similar in form to that of *Psallus*.

Female. Length 2.8 mm, width 1.12 mm. Head: width .78 mm, vertex .37 mm. Rostrum, length .61 mm, reaching to middle of intermediate coxae, apex blackish. Antennae: segment I, length, 17 mm, thickness .07 mm, yellow; II, .92 mm, slender, slightly thicker (.05 mm) on apical half, yellowish; III, .40 mm, fuscous; IV, .27 mm, fuscous. Pronotum, length .40 mm, width at base .92 mm, calli well defined by impressed line. Very similar to the male in pubescence and coloration.

Holotype: ♂ June 20, 1965, Area 401M, Nevada Test Site (H. H. Knight & J. M. Merino), taken on *Ephedra nevadensis*. **Allotype:** ♀ June 14, 1965, Area TM, Nevada Test Site (D E. Beck, H. H. Knight & J. M. Merino). **Paratype:** ♀ June 12, 1965, Area 5M, Nevada Test Site (D E. Beck, H. H. Knight & J. M. Merino).

Genus *Atractotomus* Fieber

Key to Western Species

1. Length of second antennal segment subequal to or greater than width of head 2
 Length of second antennal segment shorter than width of head 3
2. Antennal segment II as long as or greater than width of pronotum at base; legs reddish orange to brownish; length (♂) 6.5-7.7 mm, (♀) 4.4-5.0 mm *hesperius* (Uhler)
 Antennal segment II not equal to width of pronotum at base; coxae creamy white; length 3.0 mm *albidicoxis* Reut.
3. Hind tibiae pallid or white, tibial spines black, one species with dark spot at base of spines 4

- Hind tibiae dark fuscous to black 5
4. First antennal segment pallid; segment II black, pale at base, thickness equal to one-fifth the length; length 2.3 mm. *nicholi*, n. sp.
First antennal segment black; segment II black, not pale at base, thickness equal to one-third the length; length 2.4 mm *acaciae* Kngt.
5. Antennal segment II rather short, length subequal to width of vertex 6
Antennal segment II with length greater than width of vertex 7
6. Antennal segment II just slightly thicker than segment I; length 2.4 mm *purshiae* Froes.
Antennal segment II thickness (.10 mm), about one-third greater than segment I (.07 mm); length 2.6 mm *balli* Kngt.
7. Antennal segment II very thick (.17 mm), its diameter subequal to dorsal length of an eye; length 2.5 mm *reuteri* Kngt.
Antennal segment II only slightly thicker (.10 mm) than segment I (.07); length 3.0 mm *cercocarpi* Kngt.

Atractotomus purshiae Froeschner

Atractotomus purshiae Froeschner, 1963:1.

I have identified the following specimens from the Nevada Test Site: Area 401M, ♂ June 20, 1965; Area 6M, 2 ♀ June 15, 1965, taken on *Purshia tridentata*; Area TM, ♂ and nymphs June 14, 1965, on *Purshia tridentata*.

This species was described from Valley County, Idaho, where it was breeding on *Purshia tridentata*.

Atractotomus hesperius (Uhler)

Dacota hesperius Uhler, 1872:413, n. sp.

Atractotomus hesperius Knight, 1931:36, identity.

Atractotomus hesperius Froeschner, 1963:4, key.

Male specimens appear more elongate due to dimorphism in wing length.

The species is known from Arizona, California, Montana, Wyoming, Colorado, and "Dakota Territory." Eventually the species will doubtless be found in Nevada and Utah.

Atractotomus albidicoxis Reuter

Atractotomus albidicoxis Reuter, 1909:79.

Atractotomus albidicoxis Froeschner, 1963:3.

This species is known only from Arizona where type specimens came from the Chiricahua Mts. Later Arizona records: 6 ♂ ♀ June 15, 1924, alt. 7000 ft, Santa Rita Mts. (A. A. Nichol),

taken on *Robinia*. Also taken at Williams, Aug. 4, 1917 (H. H. Knight).

Atractotomus acaciae Knight

Atractotomus acaciae Knight, 1925:34.

This species was described from Arizona: 9 ♂ ♀ June 7, 1924, Tucson (A. A. Nichol), where it was found breeding on *Acacia greggii*.

Atractotomus balli Knight

Atractotomus balli Knight, 1931:38.

This species was collected at Tucson, Arizona (E. D. Ball), taken at light.

Atractotomus cercocarpi Knight

Atractotomus cercocarpi Knight, 1931:37.

This species is known from Colorado and New Mexico.

The type specimens were collected on Mountain mahogany, *Cercocarpus parvifolius*, host plant of the species.

Atractotomus reuteri Knight

Atractotomus hesperius Reuter, 1909:78, n. sp.

Atractotomus reuteri Knight, 1931:37, n. n. for preoccupied name.

Atractotomus reuteri Froeschner, 1963:5, key, distr.

The species is known from California, Arizona, and New Mexico.

Atractotomus nicholi, new species

Allied to *acaciae* Kngt., but distinguished by the pale color; legs pale yellowish, antennae pallid, segment II inflated, black, pale at base.

Male. Length 2.4 mm, width 1.15 mm. Head: width .71 mm, vertex .34 mm; pallid to yellowish. Rostrum, length .81 mm, reaching to middle of hind coxae, pale yellowish. Antennae: segment I, length .17 mm, pale; II, .61 mm, thickness .10 mm, black, pale at base; III, .23 mm, pale yellowish; IV, .20 mm, pale. Pronotum, length .47 mm, width at base .95 mm; pale to yellowish brown, median line and lateral margins of disk pale to white, a fuscous cloud on basal half, one each side of the pallid median line. Mesonotum yellowish brown, scutellum nearly white, yellowish on basal half. Dorsal surface clothed with fine, short, recumbent, yellowish to golden brown simple pubescence, and intermixed with appressed, sericeous, scalelike, silvery to golden brown pubescence. Hemelytra pallid, apical half of corium and inner apical half of clavus, shaded with yellowish brown; cuneus golden yellow, narrow outer edge and apex paler. Membrane uniformly pale fuscous, veins pallid. Ventral surface pale yellowish brown. Legs pale yellowish, without dots or marks; tibial spines black, base of spines very narrowly fuscous, forming a very small dot at base of each, or some of the spines.

Female. Length 2.5 mm, width 1.36 mm. Head: width .74 mm, vertex .34 mm. Rostrum reaching to middle of hind coxae. Antennae: segment I, length .15 mm, pallid; II, .61 mm, width .10 mm, black, pale at base; III, .20 mm, pale; IV, .18 mm. Pronotum, length .52 mm, width at base 1.10 mm. Very similar to the male in color and pubescence.

Holotype: ♂ May 16, 1928, alt. 4000 ft, Santa Rita Mts., Arizona (A. A. Nichol). **Allotype:** ♀ taken with the type. **Paratypes:** ♂ ♀ taken with the types. This species is named for the collector, Mr. A. A. Nichol, who did so much to make known the plant bugs of Arizona.

Genus *Larinocerus* Froeschner

Larinocerus balius Froeschner

Fig. 78

Larinocerus balius Froeschner, 1965: 85, Fig. 1.

I have identified the following material from the test site: Area CM, 35♂ ♀ and nymphs June 13, 1965; Area 6M, 14♂ ♀ June 17, 9♂ ♀ June 15, 1965, all specimens taken by beating

Salazaria mexicana, which is the host plant of the species.

This species is easily recognized by the inflated black antennal segments which are provided with several flat, black scalelike hairs. The body is white and covered with matted, white sericeous pubescence, and the dorsal surface sprinkled with numerous fuscous dots.

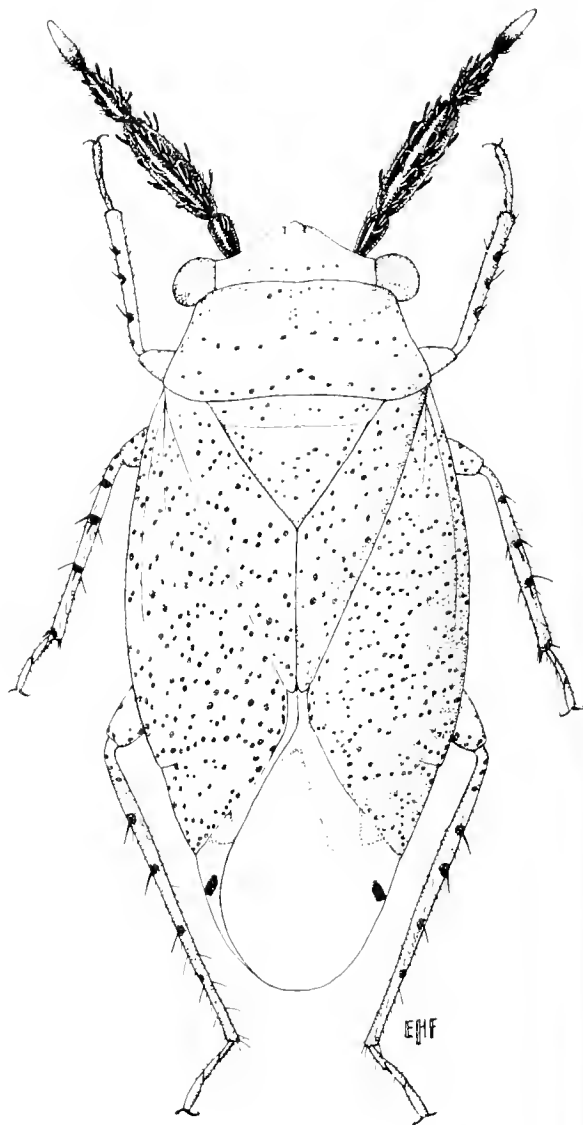


Fig. 78. *Larinocerus balius*, ♀.

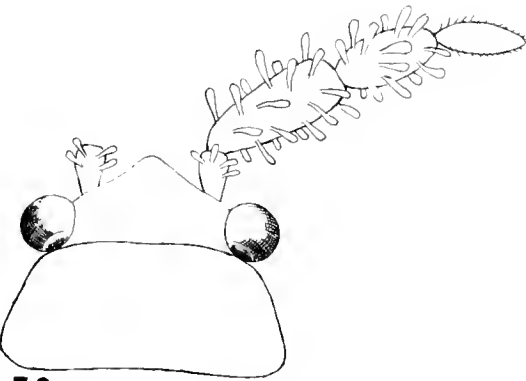
Genus *Beamerella* Knight

Beamerella personatus Knight

Fig. 79

Beamerella personatus Knight, 1959:423, Fig. 1.

This is a ground inhabiting species known from Texas.



79
Fig. 79. *Beamerella personatus*, head and antenna.

Genus *Oncotylus* Fieb.

Oncotylus guttulatus Uhler

Oncotylus guttulatus Uhler, 1894:269.

I have identified specimens collected on the test site as follows: Area 5M, 2 ♀ June 10, 1965; Area 9M, 3 ♀ June 10, 1965, taken on *Sphaeralcea*; Area 12M, 2 ♀ June 11, 1965; Area 17M, 8 ♀ June 17, 1965, taken on *Sphaeralcea*; Area 18M, ♀ June 11, ♀ Aug. 23, 1965, on *Sphae-*

ralcea; Area 401M, 7 ♂ 12 ♀ June 18, 1965, swept from *Sphaeralcea*.

This species is known from Arizona, California, and Colorado, and no doubt occurs in Utah. Nymphs and adults were collected on *Sphaeralcea*, and that genus of plants serves as host for the bugs. Since the genus *Sphaeralcea* includes several closely related species, it seems likely that *guttulatus* may occur on several species within the genus.

Nevadocoris, new genus

Allied to *Oncotylus* Fieber, pseudarolia large, attached only at basal angle of claw, and extending free and parallel with the claw to apex (Fig. 17). Dorsal surface, legs and antennae unspotted; color pallid, tibiae without a spot at base of spines. Antennae moderately long, second segment cylindrical, its length not exceeding width of pronotum at base. Clothed with two types of pubescence, bearing suberect, simple hairs and intermixed with more appressed, silvery, sericeous pubescence. Type of the genus: *Nevadocoris becki*, new species.

Key to the Species

- 1. Rostrum not reaching behind base of hind coxae 2
Rostrum reaching beyond the hind coxae; femora pallid; length of second antennal segment clearly exceeding width of head *pallidus*, n. sp.
- 2. Rostrum reaching upon base of middle coxae; length of second antennal segment not equal to width of head *bullatus*, n. sp.
Rostrum reaching to base of hind coxae; length of second antennal segment (♂) equal to width of head, but somewhat less in the female *becki*, n. sp.

Nevadocoris becki, new species

Fig. 17

Distinguished in the key; rostrum just reaching upon base of hind coxae.

Male. Length 3.5 mm, width 1.26 mm. Head: width .83 mm, vertex .49 mm; pallid. Antennae: segment I, length .20 mm, pale; II, .82 mm, cylindrical, pallid; III, .51 mm, pale; IV, .34 mm, dusky. Rostrum, length .92 mm, reaching to base of hind coxae, pale, apex blackish. Pronotum, length .47 mm, width at base 1.10 mm, pallid, calli poorly defined. Dorsal surface clothed with suberect, simple pale pubescent hairs, and intermixed with more appressed, silvery sericeous pubescence. Scutellum and meso-

notum pallid. Hemelytra uniformly pallid, sub-translucent, euneus substance and color similar to corium; membrane uniformly dusky, not clear, veins white. Ventral surface pallid, thorax and legs tinged with yellow, femora somewhat deeper yellow. Tibiae pallid, spines clear, without dots at base; tarsi pallid, claws fuscous. Genital segment and claspers simple, tip of flagellum rests across middle of left clasper, much as in *Plagiognathus*.

Female. Length 2.9 mm, width 1.3 mm. Head: width .86 mm, vertex .50 mm, pallid tinted with yellow. Antennae: segment I, length .22 mm, pallid; II, .68 mm, pallid; III, .44 mm, dusky; IV, .34 mm, dusky. Pronotum, length .44 mm, width at base 1.0 mm; pallid, tinged with

yellow; femora distinctly yellow. More robust than the male but very similar in color and pubescence.

Holotype: ♂ June 14, 1965, Area 401M, Nevada Test Site (D E. Beck, H. H. Knight & J. M. Merino). **Allotype:** ♀ same data as the type. **Paratypes:** 7♂ 7♀ June 14, 1965, Area 401M, Nevada Test Site, collected with the types on *Tetradymia glabrata* (D E. Beck, H. H. Knight & J. M. Merino). 2♀ June 11, 1965, Area 16M; 47♂ ♀ June 15, 1965, Area 6M; ♂ June 16, 1965, Area 17M; ♂ ♀ July 17, 1965, Area 18M, Nevada Test Site (D E. Beck, H. H. Knight & J. M. Merino), collected on *Tetradymia glabrata*, which is the host plant of the species.

Nevadocoris pallidus, new species

Separated from *becki* by the longer rostrum, larger size, and by the longer second antennal segment which exceeds width of head across eyes.

Male. Length 4.2 mm, width 1.6 mm. Head: width .85 mm, vertex .40 mm, pallid, eyes light brown. Antennae: segment I, length .22 mm; II, 1.12 mm, cylindrical, slightly thicker toward apex, pallid; III, .68 mm; IV, .40 mm, pallid. Rostrum, length 1.5 mm, reaching upon posterior trochanters, pallid, apex black. Pronotum, length .56 mm, width at base 1.22 mm. Dorsal surface uniformly pallid, hemelytra subtranslucent, clothed with suberect, simple hairs, and sparsely intermixed with more appressed, silvery, sericeous pubescence. Membrane tinted milky white, veins white. Ventral surface pallid, venter with pallid simple pubescence; genital segment quite small, claspers minute. Legs uniformly pallid, likewise the tibial spines, without marks of any kind.

Female. Length 3.5 mm, width 1.5 mm. Head: width .82 mm, vertex .44 mm. Antennae: segment I, length .20 mm; II, .92 mm, cylindrical, slender; III, .71 mm; IV, .40 mm; pallid. Pronotum, length .48 mm, width at base 1.2 mm. Rostrum, length 1.5 mm, reaching upon posterior trochanters. More robust than the male but very similar in color and pubescence.

Holotype: ♂ June 14, 1965, Area 401M, Nevada Test Site (D E. Beck, H. H. Knight & J. M. Merino). **Allotype:** ♀ same data as the type. **Paratypes:** 3♂ 3♀ taken with the types on *Grayia spinosa*, which is the host plant of this species. 4♀ June 11, 1965, Area 16M; ♂ 2♀ June 18, 1965, Area 401M, Nevada Test Site (D

E. Beck, H. H. Knight & J. M. Merino), taken on *Grayia spinosa*.

Nevadocoris bullatus, new species

Fig. 18

Allied to *becki* but size larger, and rostrum only reaching upon base of middle coxae; head black, vertex pale, calli black; tibial spines black but without black spot at base of spines.

Male. Length 3.4 mm, width 1.6 mm. Head: width 1.02 mm, vertex .54 mm; black, vertex pale, clothed with appressed, silvery sericeous pubescence. Antennae: segment I, length .23 mm, yellowish, base and apex shaded with fuscous; II, .85 mm, cylindrical, slightly more slender at base, yellowish, clothed with fine, short, pale pubescence; III, .54 mm, yellowish; IV, .30 mm, fuscous. Rostrum, length .85 mm, reaching upon base of middle coxae, fuscous to black. Pronotum, length .54 mm, width at base 1.12 mm, pale to yellowish, calli fuscous to black; pubescence as on head, scutellum and hemelytra, clothed with appressed, in part matted, silvery sericeous pubescence, sparsely intermixed with suberect, simple fuscous hairs. Scutellum and mesonotum fuscous, somewhat paler each side and on apex. Hemelytra pale to yellowish, corium more or less infuscated inside of radial vein, also along claval suture; membrane uniformly fumate, veins more pallid. Ventral surface black, propleura pallid. Legs yellow, femora becoming black in darkest forms; tibiae pale to yellowish, spines black, without black spots at base of spines, tarsi fuscous.

Female. Length 3.4 mm, width 1.5 mm. Head: width 1.05 mm, vertex .64 mm. Antennae: segment I, length .23 mm, thickness .08 mm, yellowish, fuscous on base and apex; II, .74 mm, cylindrical, slender, thickness .06 mm, distinctly thinner than segment I, yellow; III, .54 mm, dusky yellow; IV, .27 mm, dusky. Pronotum, length .54 mm, width at base 1.19 mm. Ventral surface black, sides of thorax and the venter covered by a mat of appressed, silvery, sericeous pubescence. Legs yellow, coxae black, bases and femora somewhat infuscated; femora clear yellow, with just a few minute dots indicating the median line on anterior face. More robust than the male but very similar in color and pubescence.

Holotype: ♂ June 15, 1965, Area 6M Nevada Test Site (D E. Beck, H. H. Knight & J. M. Merino). **Allotype:** ♀ same data as the type. **Paratypes:** ♂ 8♀ taken with the types. ♀

June 11, Area 16M; 2♂ 2♀ June 13, Area CM; 2♂ 1♀ June 17, Area 6M, Nevada Test Site, taken on *Salazaria mexicana*; ♂ 5♀ June 14, Area TM; 2♂ June 16, 2♀ June 12, 2♀ June 17, 1965, Area 17M; ♂ ♀ June 14, ♂ June 18, 1965, Area 401M, Nevada Test Site (D. E. Beck, H. H. Knight & J. M. Merino). A few specimens were taken on *Chrysothamnus*, so I am uncertain about the preferred host of this species.

Brachyceratocoris, new genus

Related to *Macrotylus* Fieber with the large, prominent clypeus projecting anteriorly; pseud-*arolia* very large, attached only at base on basal tooth of the claw (Fig. 19); *arolia* represented by two erect bristles that arise between and slightly above basal attachment of claws. Differs from *Macrotylus* in the short and thickened second and third antennal segments; length of segment II subequal to width of head across eyes. In the male, segment II is strongly thickened, slightly flattened, in width greater than segment I; width of segment III about equal to segment I. Rostrum just reaching upon middle coxae. Pronotum with lateral margins strongly sulcate, rounded off except at anterior angles and opposite the calli where the edges are sharply projecting. Dorsal surface clothed rather thickly with moderately long, suberect hairs. Genital segment and claspers typical of the Phylinae, the tip of the flagellum twisting to the left, lying closely within bend of left clasper, and extending downward and beyond it to the left side. Type of the genus: *Brachyceratocoris nevadensis*, new species.

Brachyceratocoris nevadensis, new species

Fig. 19

Distinguished by the short but thick second and third antennal segments; segment II subequal to width of head.

Male. Length 3.6 mm, width 1.2 mm. Head: width .72 mm, vertex .30 mm; clypeus prominent as in *Macrotylus*, eyes large; black, spot on middle of vertex, broad median line of frons, and the bucculae, white. Rostrum, length 1.1 mm, reaching to base of middle coxae, pallid, apex brownish black. Antennae: segment I, length .22 mm, thickness .10 mm, black, apex white; II, .72 mm, width .12 mm, somewhat flattened, narrow diameter .085 mm, dark brown, blackish next to the narrow white base, narrow apex pallid, clothed with short brownish pubescence; III, .61 mm, thickness .08 mm,

dark brown, narrow base and apex white; IV, .37 mm, brown. Pronotum, length .68 mm, width at base 1.12 mm; disk moderately convex, lateral margins sulcate, more sharply curved near basal angles, margin rounded but anterior angles are just opposite the calli, sharply projecting as a carinate edge; anterior margin with flat edge in place of a collar, elevated between that and the prominent convex calli, which have impressed margins; pallid to fuscous, propleura and impressed edges of calli black; anterior edge of coxal cleft strongly protruding, white, xyphus flat, blackish.

Dorsal surface, including head, clothed with long pallid to brownish, erect pubescent hairs, hairs shorter on corium, cuneus and embolium. Mesonotum moderately exposed, black, white spot each side. Scutellum black, strongly convex, elevated sharply from lateral margins. Hemelytra subtranslucent, inner half of clavus fuscous, embolium shaded with fuscous, cuneus uniformly pallid; membrane fuscous, somewhat darker behind smaller areole, veins white. Ventral surface pallid to fuscous; venter pallid to white, sides fuscous to black. Legs pallid, femora infuscated on apical half but apices remain pallid; hind femora with a row of fuscous dots on mid line of anterior aspect; tibiae fuscous to black at base, spines confused with strong hairs, pale; tarsi and claws black. Genital segment distinctive, claspers and flagellum typical of the Phylinae; tip of flagellum twisted to the left, resting closely within bend of left clasper, and extending downward and beyond it to the left side.

Female. Length 4.3 mm, width 1.5 mm, narrower across bases of cuneus, only 1.3 mm. Head: width .78 mm, vertex .37 mm; pallid to white, clypeus black. Antennae: segment I, length .27 mm, black, apex white; II, .81 mm, basal half slender, apical half sharply thicker, .12 mm, greater than segment I, pallid, fuscous on apex, black on slender base; III, .68 mm, fuscous; IV, .42 mm, fuscous. Pronotum, length .71 mm, width at base 1.39 mm; pallid, infuscations lacking. Larger than the male, color more pallid, but pubescence similar.

Holotype: ♂ June 24, 1965, Area 19M, Nevada Test Site (H. H. Knight & J. M. Merino). **Allotype:** ♀ same data as the type. **Paratypes:** 19♂ 16♀ collected with the types, sweeping along the road side. Specimens were swept mostly from *Chaenactis stevioides*, which is most likely the host plant, but other low growing plants were mixed in with the situation.

Genus *Macrotylus* Fieber*Macrotylus salviae*, new species

Allied to *vanduzeei* Kngt. but differs chiefly in the milky white color, hemelytra subtranslucent and bristles with fuscous spot at base of each; length of second antennal segment not equal to width of pronotum at base.

Male. Length 5.0 mm, width 1.6 mm. Head: width .71 mm, vertex .34 mm; central area of vertex, median band of frons, jugs and bucculae, white; vertex with six erect bristles set on basal line, frons with five or six bristles on central area. Rostrum, length 2.0 mm, reaching to middle of venter, black. Antennae: segment I, length .30 mm, black, narrow apex white; II, 1.25 mm, cylindrical, more slender near base, black, set with suberect black hairs; III, .81 mm, black; IV, .34 mm, brownish black. Pronotum, length .68 mm, width at base 1.36 mm; lateral edges of disk nearly straight, rather sharp edges, anterior margin elevated, white, calli black, shining; disk provided with numerous but not crowded, erect, truncated black bristles. Mesonotum prominent, black; scutellum strongly convex, white to fuscous, set with about 25 rather short, erect, black bristles. Hemelytra milky white, subtranslucent, provided with rather sparsely set, erect black bristles, each with a distinct fuscous spot at base; apical area of corium and apical one-fourth, fuscous; embolar margins nearly parallel, straight; cuneus white, provided with recumbent black hairs; membrane fuscous, veins white. Ventral surface black, frosted, sides more shining. Legs pallid to white, in part shaded with fuscous; femora with fuscous dots, tibiae with fuscous hairs but without dots; tarsi and claws black.

Female. Length 4.2 mm, width 1.56 mm. Head: width .75 mm, vertex .41 mm. Antennae: segment I, length .30 mm; II, 1.43 mm, cylindrical; III, .81 mm; IV, .37 mm, black. Pronotum, length .65 mm, width at base 1.56 mm; lateral margins sinuate near base. Venter white, lateral margins with black spot on each segment. Legs pallid to white, black spots forming a distinct row on middle of anterior face; otherwise, color and black bristles on dorsum very similar to the male.

Holotype: ♂ June 11, 1965, Area 12M, Nevada Test Site (D. E. Beck, H. H. Knight & J. M. Merino). **Allotype:** ♀ taken with the type. **Paratypes:** 15♂ 15♀ taken with the types on *Salvia dorrii*, which is the host plant of the species. The plants grew in clumps, the blue flowers making quite a show when in blossom.

Macrotylus infuscatus Van Duzee

Macrotylus infuscatus Van Duzee, 1916: 10.

I have identified specimens of this species from the test site as follows: Area 19M, 5♂ 1♀ June 24, 1965.

This species was described from Fallen Leaf Lake, California, where it was collected in July, 1915. It has not been reported from elsewhere since the original description.

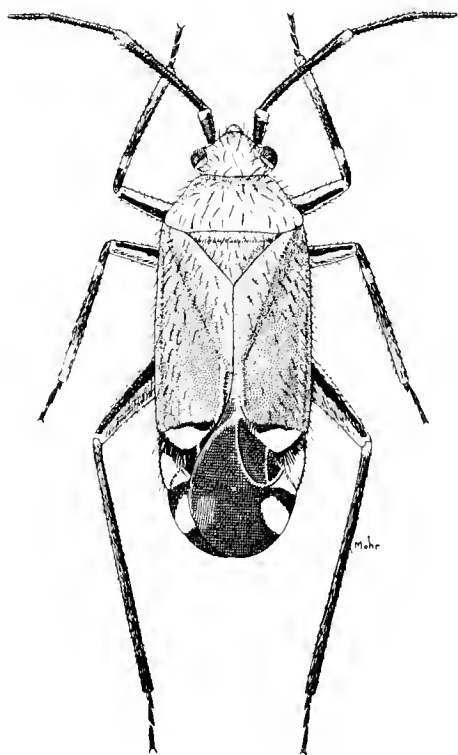


Fig. 80. *Macrotylus amoenus*, ♀.

Genus *Coquillettia* Uhler*Coquillettia albella*, new species

Allied to *foxi* Van D. but size smaller and second antennal segment relatively shorter; about the size of *granulata* Kngt., but differs in having lateral margins of disk rounded off, indistinct.

Male. Length, 3.6 mm. Head: width .71 mm, vertex .29 mm, brownish orange. Antennae: segment I, length .20 mm, thickness .09 mm, brownish orange; II, 1.05 mm, thickness .08 mm, brown orange; III, .75 mm, fuscous; IV, .44 mm. Rostrum, length 1.26 mm, reaching to base of middle coxae, brownish black. Pronotum, length .64 mm, width at base .95 mm, lateral margins not clearly delimited, basal margin slightly and broadly sulcate; fuscous brown, calli

and pleura more brownish orange. Scutellum and mesonotum dark fuscous brown; minutely and sparsely pubescent. Hemelytra chiefly white, clavus creamy white, dusky on base; corium diaphanous inside radial vein, and posteriorly as far as a transverse line drawn across apex of clavus, dull black behind this line; embolium and outer edge of corium creamy white, but terminates where the black area begins; cuneus white, opaque, apical two-fifths black; veins and membrane white, subtranslucent, apical half or behind the areoles, fuscous. Mesothorax dark brown, ostiolar peritreme white; legs fuscous brown, front coxae more orange. Venter black, narrowed near base, posterior margin of third segment broadly white.

Holotype: ♂ June 20, 1965, Area CT, Nevada Test Site (H. H. Knight & J. M. Merino). **Paratypes:** ♂ Aug. 20, 1965, Area 16M, Nevada Test Site (J. M. Merino), sweeping over *Eriogonum deflexum*. 5♂ and 2 nymphs July 19, 1965, Area 6M (D. E. Beck & J. M. Merino), sweeping on *Eriogonum inflatum*.

Coquillettia ajo, new species

Allied to *jessiana* Kngt., but differs with longer antennal segments, narrower vertex, brownish black clavus and apical area of corium.

Male. Length 5.6 mm, width 1.46 mm. Head: width .82 mm, vertex .27 mm; dark brown, eyes large, width of vertex just equal to dorsal width of an eye. Rostrum, length 1.26 mm, brownish black, just reaching to middle of mesosternum. Antennae: segment I, length .34 mm, fuscous brown; II, 1.94 mm, cylindrical, slender, length slightly greater than from base to apex of clavus (1.83 mm), fuscous brown; III, 1.77 mm, dark brown; IV, .78 mm, dark brown. Pronotum, length .68 mm, width at base 1.12 mm, collar strongly narrowed, width .41 mm; strongly declivitous from basal margin to base of calli; dark brown in color. Mesonotum and scutellum brownish black, shining. Hemelytra with embolar margins nearly straight, widened slightly at apex; embolium and diaphanous corium white, clavus and apical area of corium uniformly brownish black; apical black area begins at apex of clavus, anterior edge curves slightly to rear and across embolium; cuneus and paracuneus opaque white, apical half brownish black; membrane and veins uniformly dark brown, only a shade lighter than apex of cuneus. Pubescence on dorsal surface minute and sparsely set. Ventral surface brownish black, mesosternum polished; ostiolar peri-

treme white. Legs uniformly brownish black. Venter brownish black, polished; posterior margin of third ventral segment greenish white, margin of second segment narrowly pale.

Holotype: ♂ April 25, 1935, Ajo, Arizona (F. H. Parker). **Paratype:** ♂ taken with the type.

Coquillettia virescens, new species

Allied to *uhleri* Van Duzee, hemelytra white, with clavus, apical half of cuneus, apical area of corium and embolium, black; the white areas tinged with green.

Male. Length 5.2 mm, width 1.36 mm. Head: width .82 mm, vertex .30 mm; yellowish brown, frons fuscous. Rostrum, length 1.53 mm, reaching to near base of mesosternum, black, first two segments brownish. Antennae: segment I, length .31 mm, greenish yellow; II, 1.9 mm, cylindrical, slightly thicker on apical half, approximately equal to segment I in thickness, brownish yellow, apical half fuscous brown; III, 1.63 mm, slender, fuscous brown; IV, .74 mm, fuscous brown. Pronotum, length .85 mm, width at base 1.22 mm, brownish black, collar and calli brownish. Hemelytra white, clavus black, apical area of corium and embolium black, the anterior edge of black area on corium, begins slightly before apex of clavus, angles obliquely, slightly posteriorly to reach embolar margin, apical half of cuneus black; white areas tinged greenish by green color in hypodermal layer; membrane fuscous. Dorsal surface sparsely clothed with fine, short, recumbent simple pubescent hairs, yellowish on black areas, and pallid on white areas. Ventral surface brownish black, shining; ostiolar peritreme white, protrudes as a rounded tubercle just above ostiole. Venter brownish black, shining, posterior margin of third segment greenish white. Legs brownish black, hind tibiae black, more brownish near base.

This is the first species of *Coquillettia* we have seen with green in the hypodermis giving a green tint to the white areas.

Holotype: ♂ May 16, 1961, Area MD (Mercury), Nevada Test Site.

Coquillettia luteiclava, new species

Allied to *albiclava* Kngt., about the same size but distinguished by the orange-colored clavus.

Male. Length 6.0 mm, width 1.50 mm. Head: width .92 mm, vertex .40 mm; color reddish to brown orange; tip of clypeus extends

beyond antennal fossa by .44 mm; eyes prominent, height of eye .51 mm. Antennae: segment I, length .34 mm, thickness .10 mm, reddish orange; II, 2.2 mm, thickness .10 mm, slightly more slender near base, reddish brown, pubescence short, pale to brownish; III, 1.9 mm, blackish; IV, .96 mm, black. Rostrum, length 1.77 mm, reaching only slightly beyond middle of mesosternum, brownish black. Pronotum, length .92 mm, width at base 1.36 mm; lateral margins rounded, nearly straight as viewed from above, basal margin slightly, broadly sulcate; dusky orange, calli poorly defined, basal margin slightly impressed. Mesonotum broadly exposed, scutellum moderately convex, reddish orange.

Hemelytra with embolar margins nearly straight, slightly broader near base of cuneus; clavus reddish orange, base and apex and claval suture slightly infuscated; corium diaphanous to near apex of clavus, apical margin of this area making an oblique line as it angles forward to meet radial vein which it follows to base of corium; embolium and apical area of corium fuscous gray, apical margin blackish; cuneus black, basal one-third opaque white; membrane and veins dark fuscous, basal area which lies between white areas of cuneus, pale to whitish. Thorax and legs orange brown, the legs slightly darker, tarsi and apices of tibia and the spines black. Venter brownish black, basal half more slender, sternite of third segment with posterior margin white.

Female. Length 4.6 mm, width of abdomen 1.76 mm. Head: width 1.09 mm, vertex .61 mm; brownish orange. Antennae: segment I, length .32 mm, thickness .10 mm on basal half; II, 2.1 mm, more slender than I, reddish orange, apex fuscous; III, 1.63 mm, brownish black; IV, .92 mm, blackish. Rostrum, length 1.77 mm, reach-

ing between middle coxae, brownish black. Thorax wingless, typical of the genus, reddish brown. Venter broadly ovate, first three segments narrowed, third segment white on posterior border of sternite; second segment pale on posterior margins.

Holotype: ♂ June 24, 1965, Area 19M, Nevada Test Site (H. H. Knight & J. M. Merino). **Allotype:** ♀ taken with the type. **Paratypes:** 5♂ 5♀ taken with the types, sweeping low vegetation, mostly *Chaenactis* and *Hymenoclea*.

Genus *Orectoderus* Uhler

Orectoderus longicollis Uhler

Fig. 81

Orectoderus longicollis Uhler, 1895:47, n.g., n.sp.

This species is known only from Colorado. It may be recognized by the dull waxlike surface of the pronotum, sulcate lateral margins, and the tumidly convex calli; clavus white, blackish at base but not beyond apex of the scutellum.

Orectoderus arcuatus Knight

Orectoderus arcuatus Knight, 1927:302.

Known from the state of Washington. It may be distinguished from *longicollis* Uhler by the white band extending along inner edge of corium and upon base of cuneus; disk of pronotum polished and shining.

Orectoderus schuhi Knight

Orectoderus schuhi Knight, 1964:149

This species is known only from Oregon. It may be recognized by the orange red color on outer half of clavus and basal half of corium.

Genus *Teleorhinus* Uhler

Key to the Species

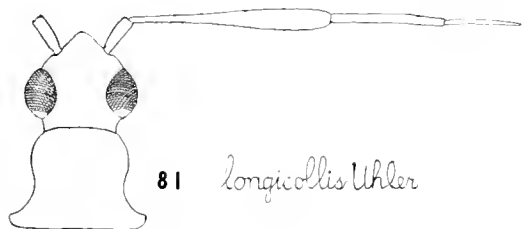
- | | |
|--|-----------------------------|
| 1. Pronotal disk strongly shining | 2 |
| Pronotal disk dull, opaque | <i>oregoni</i> , n. sp. |
| 2. Antennal segment II pallid on basal half | 3 |
| Antennal segment II uniformly black | <i>nigricornis</i> , n. sp. |
| 3. Antennal segment II inflated for more than half its length, cylindrical and slender only on basal one-third | 4 |
| Antennal segment II inflated for not more than half its length | 5 |

4. Pronotum with lateral margins rounded, slightly sulcate; coxae and femora orange red; antennal segment II shorter, length 2.1 mm *cyaneus* Uhler

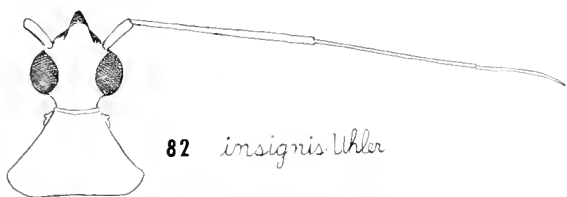
Pronotum with lateral margins straight, angulate; coxae pallid, front femora yellowish; antennal segment II longer, length 2.4 mm. *brindleyi*, n. sp.

5. Antennal segment II with apical two-fifths of length inflated (♀); coxae pallid or white, all femora orange red *utahensis*, n. sp.

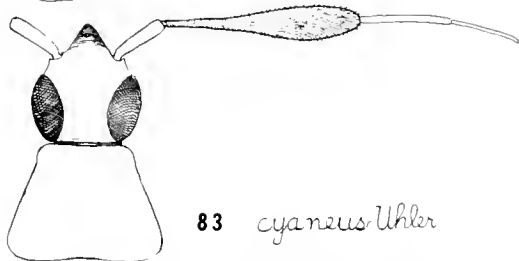
Antennal segment II with just a little less than half its length inflated (♀); coxae pale yellowish, femora amber brown *tephrosicola* Knegt.



81 *longicollis* Uhler



82 *insignis* Uhler



83 *cyaneus* Uhler

Figs. 81-83. Head and antenna. 81, *Orectoderus longicollis*, ♀; 82, *Coquillettia insignis*, ♂; 83, *Teleorhinus cyaneus*, ♀

Teleorhinus cyaneus Uhler

Fig. 83

Teleorhinus cyaneus Uhler, 1890:75, n. g., n. sp.

This species is distinguished by having apical half of second antennal segment suddenly inflated to a thickness three times greater than segment I.

Described from two females collected in the Los Angeles area of California about the year 1888. I have examined one of the type specimens but have not seen new material collected in recent years.

Teleorhinus utahensis, new species

Runs in the key to the couplet with *tephrosicola* Knegt., from which it differs by having

only the apical two-fifths of second antennal segment inflated.

Female. Length 5.6 mm, width 2.1 mm. Head: width 1.1 mm, vertex .58 mm. Rostrum, length 2.4 mm, reaching upon middle of the intermediate coxae, dark brown, apical half blackish. Antennae: segment I, length .37 mm, brownish black; II, 1.77 mm, apical two-fifths inflated (.75 mm thick), black, basal section (.98 mm length) slender, cylindrical, pallid; III, .88 mm, slender, pallid; IV, .61 mm, black. Pronotum, length 1.25 mm, width at base 1.63 mm, shining black, disk rugulose punctate, with very fine, short, dusky pubescence; lateral margins of disk rounded, slightly sulcate as viewed from above. Scutellum nearly flat, finely transversely rugulose, black. Hemelytra pitch black, shining, finely punctate, rather coarsely rugulose waved, clothed with fine, short, recumbent simple hairs; cuneus and membrane turned downward at a sharp angle, uniformly black. Ventral surface shining black. Coxae pallid, black at extreme base; all femora orange red to amber brown, trochanters brownish; tibiae pallid, tips blackish, spines black; tarsi black, middle segment brownish.

Male. Length 6.8 mm, width 2.1 mm. Head: width 1.1 mm, vertex .54 mm. Antennae: segment I, length .34 mm, brownish black; II, 1.8 mm, basal half cylindrical, slender, pallid, apical part (.85 mm) inflated, thickness .20 mm, thickly clothed with recumbent pubescent hairs; III, .95 mm, slender, pale fuscous; IV, .64 mm, fuscous. Pronotum, length 1.36 mm, width at base 1.66 mm. Color of legs similar to the female.

Holotype: ♀ June 29, 1965, Scipio, Utah (H. H. Knight). **Allotype:** ♂ taken with the type. **Paratypes:** 2♂ June 7-17, 1916, alt. 6400 ft, Jemez Springs, New Mexico (J. Woodgate). ♀ "N. Mex."

Teleorhinus brindleyi, new species

Runs in the key close to *cyaneus* Uhler, but differs in the longer second antennal segment;

pronotum with lateral margins straight, angulate.

Female. Length 6.5 mm, width 2.3 mm. Head: width 1.10 mm, vertex .54 mm; shining, black. Rostrum, length 2.3 mm, reaching upon middle coxae, black. Antennae: segment I, length .44 mm, black; II, 2.3 mm, slender on base, apical half inflated, thickness .34 mm, black, the slender basal section pale fuscous, blackish at base, inflated section covered with short black recumbent hairs; III, .98 mm, black, slender; IV, .64 mm, black. Pronotum, length 1.22 mm, width at base 1.7 mm; lateral margins straight, angulate, calli evident, anterior margin flat, collar not indicated; disk rugulose punctate, clothed with minute pubescent hairs set in shallow depressions, giving the surface a rough appearance, but the calli and anterior margin smooth and shining. Scutellum moderately convex, impunctate but minutely transversely rugulose; mesonotum moderately exposed, black. Hemelytra brownish black, sparsely clothed with minute pubescent hairs, but longer hairs apically; punctures small but set in shallow foveate depressions, giving a rough pitted appearance to the surface; cuneus uniformly brownish black, outer margin slightly arcuated, and turned down sharply over end of abdomen. Membrane and veins dark brown. Ventral surface brownish black, polished and strongly shining. Legs light yellowish brown, coxae more pallid but reddish brown at base; front femora yellowish brown but middle and hind pair reddish orange in color, without marks or shading; tibiae yellowish brown, spines black, tips of tibiae and the tarsi black.

Holotype: ♀ June 21, 1936, Moscow Mountain, Idaho (T. A. Brindley). **Paratypes:** ♀ June 26, 1935, alt. 2157 ft, Coeur d'Alene, Idaho (J. M. Beck). ♂, Farson, Big Sandy Creek, Wyoming (D E. Beck).

Teleorhinus nigricornis, new species

Allied to *cyaneus* Uhler in form, but with antennae uniformly black; distinguished by having four rather large foveate punctures across posterior margin of the swollen area of the calli.

Female. Length 6.4 mm, width 2.3 mm. Head: width 1.12 mm, vertex .58 mm; shining black. Rostrum, length 2.3 mm, just reaching base of middle coxae, brownish black. Antennae: segment I, length .44 mm, black; II, 2.3 mm, basal one-third slender, the apical two-thirds incrassated, inflated to a thickness of .28 mm on

apical half, black, bearing brownish recumbent hairs; III, .95 mm, slender, black; IV, .61 mm, black. Pronotum, length 1.15 mm, width at base 1.64 mm; lateral margins angulate but edges rounded, perceptibly sulcate; disk sparsely punctate, roughly and irregularly rugulose, moderately shining, having four rather large foveate punctures forming a transverse line across posterior margin of the swollen area formed by the calli. Scutellum nearly flat, finely transversely rugulose, with a fine transverse impressed arcuate line near base; the mesonotum moderately exposed. Hemelytra black, shining, minutely pubescent, coarsely punctate, the punctures rather small but placed in shallow depressions, which produce the impression of a rough surface. Membrane and veins brownish black. Ventral surface black, shining, mesosternum polished. Coxae pale yellowish, brownish on base, femora orange brown, unmarked; tibiae yellowish brown, spines black, tarsi black.

Male. Length 8.0 mm, width 2.4 mm. Head: width 1.02 mm, vertex .44 mm, brownish black, shining. Rostrum, length 2.14 mm, reaching upon middle coxae, brownish black. Antennae: segment I, length .41 mm, black; II, 2.21 mm, black, slender on basal third, becoming gradually thicker on apical half, thickness .15 mm, more slender than in the female; III, 1.02 mm, slender, black; IV, .68 mm, black. Pronotum, length 1.22 mm, width at base 1.8 mm. Color, pubescence, foveate punctures across calli, all very similar to female.

Holotype: ♀ June 21, 1932, Tieton Canyon, Washington (A. R. Rolfs). **Allotype:** ♂ same data as the type. **Paratypes:** ♂ June 10, 1891, Lake Tahoe; ♂ May, Los Angeles County, California (Coquillett).

Teleorhinus oregoni, new species

Differs from all known species of the genus by the dull, opaque surface of the pronotum.

Male. Length 7.8 mm, width 2.3 mm. Head: width 1.19 mm, vertex .51 mm. Rostrum, length 2.6 mm, brownish black, reaching to apex of middle coxae. Antennae: segment I, length .44 mm, brown; II, 2.27 mm, cylindrical on basal half, apical half incrassated, greatest thickness .17 mm, brown, dark brown on thick part, thickly clothed with suberect brown hairs; III, 1.19 mm, brownish black; IV, .64 mm, brownish black. Pronotum, length 1.46 mm, width at base 1.7 mm; black, surface dull, opaque, transversely rugulose, clothed with short recumbent on disk and erect anteriorly, brown pubescent hairs;

lateral margins rounded, sulcate, calli appear as swollen, elevated callosities. Scutellum moderately convex, mesonotum broadly exposed, both black and with dull opaque surface. Hemelytra uniformly black, moderately shining, surface somewhat uneven or slightly waved, clothed with fine short, sparsely set, brown pubescent hairs. Membrane and veins rather uniformly

colored, a medium dark brown. Ventral surface dull, black, mesosterum polished. Legs reddish brown, brownish black on base of coxae; tibial spines black. Genital segment and claspers typical for the genus.

Holotype: ♂ June 17, 1934, Summit of Bly Mountain, Oregon (J. Schuhl). **Paratype:** ♂ same data as the type.

Subfamily DICYPHINAE

Key to the Genera

- 1. Eyes large, postocular space of the head about equal to thickness of second antennal segment *Cyrtopeltis* Fieber, p. 75
Eyes removed from pronotal collar by a distance much greater than thickness of second antennal segment 2
- 2. Eyes relatively large, separated from pronotal collar by a space equal to or less than the length of eyes as seen from above; head slightly wider than long *Dicyphus* Fieber, p. 67
Eyes rather small, separated from pronotal collar by a space equal to or greater than length of an eye as seen from above; head about as long as wide *Macrolophus* Fieber, p. 75

Genus *Dicyphus* Fieber

Key to the Species

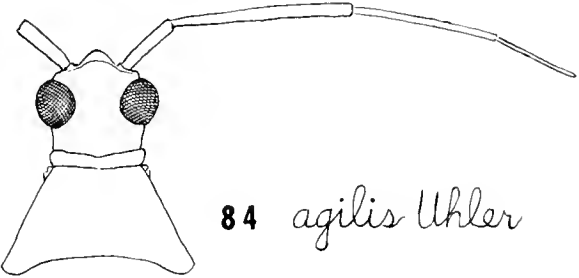
- 1. Rostrum long, reaching behind tips of middle coxae 2
Rostrum shorter, not reaching beyond tips of middle coxae 7
- 2. Ostiole situated near center of the peritreme, ostiole cavity easily observed 5
Ostiole located in the narrowed ventral third of the peritreme 3
- 3. Head black, with two pale spots on base of vertex *elongatus* Van D.
Head uniformly yellowish 4
- 4. First antennal segment black, apex only pale; corium pale yellowish, with a blackish spot on outer apical angle *usingeri* Kngt.
First antennal segment uniformly yellowish; corium greenish yellow *rivalis* Kngt.
- 5. Antennal segment I pallid on middle, reddish black on base and apex 6
Antennal segment I black, not paler on middle; head black, neck behind vertex with a pair of pallid spots, separated on median line by blackish *hesperus* Kngt.
- 6. Collar width narrowed above on median line axis of pronotum; length of antennal segment II exceeds width of pronotum (♂), apex black; membrane infuscated on apical half *paddocki*, n. sp.
Collar width not reduced on median line above; length of antennal segment II not equal to width of pronotum at base, pallid, sometimes fuscous near

- base but always paler on apex; membrane not infuscated
..... *pallicornis* (Fieb.)
7. Hemelytra uniformly pallid or yellowish, or pallid but with tip of cuneus and a round spot on corium black 8
Hemelytra with fuscous or reddish shading, without a round black spot on corium 11
8. Hemelytra pallid, but with a rounded fuscous or black spot on apical area of corium 9
Hemelytra uniformly pallid or yellowish, without spots or marks on corium or cuneus; antennal segment I white, with a fuscous annulus on basal half; segment II not equal to width of pronotum at base; length 3.2 mm
..... *stitti*, n. sp.
9. Length of antennal segment II not exceeding width of pronotum at base 10
Length of antennal segment II distinctly greater than width of pronotum at base; length 3.5 mm *notatus* (Dist.)
10. Length of second antennal segment greater than segment III; length 2.7 mm
..... *minimus* (Quaint.)
Length of second antennal segment subequal to length of III; length 2.4 mm
..... *disclusus* Van D.
11. Corium with fuscous spot or dark shading, or corium red for full width at apex 12
Dorsal surface with bright red in the hypodermis, cuneus red, corium without fuscous spot or dark shading *tinctus* Kngt.
12. Length of second antennal segment equal to width of pronotum at base plus dorsal width of an eye, or more 13
Length of second antennal segment not equal to width of pronotum plus dorsal width of an eye 16
13. Second antennal segment black 14
Second antennal segment white, fuscous only on base *rufescens* Van D.
14. Cuneus with apex and tip of embolium fuscous to black 15
Cuneus without black on apex and on tip of embolium (♂) *dipiaci*, n. sp.
15. Hemelytra with reddish; male left clasper strongly curved on apical half, rather thick, curved back toward base (Fig. 89) *agilis* Uhl.
Hemelytra without red; male left clasper slender on apical half, nearly vertical in position (Fig. 90); length 4.3-4.6 mm *rubi*, n. sp.
16. Corium with red 17
Corium uniformly pallid, without red; antennae fuscous to black; length 3.8-4.1 mm (♀) *dipiaci*, n. sp.
17. Corium with red on full width of apical area of corium and embolium 20
Corium with red only on edge of inner apical angles 18
18. Scutellum and pronotal disk with pale or white 19
Scutellum and pronotum uniformly black; length 3.4-4.4 mm *ribcsi*, n. sp.

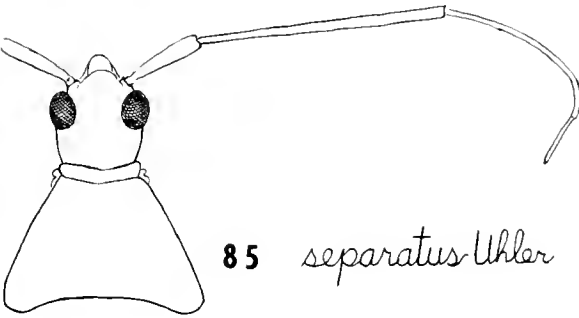
19. Cuneus with apex and tip of embolium fuscous to black *agilis* Uhl.
Cuneus and tip of embolium without black on apex (♀) *diplaci*, n. sp.
20. Length of antennal segment II greater than width of pronotum 2I
Length of antennal segment II not equal to width of pronotum at base
..... (♀) *californicus* (Stal)
21. Female, with length of antennal segment II greater than width of pronotum at
base; length 4.2 mm *phaceliae*, n. sp.
Male, with length of antennal segment II greater than width of pronotum at
base; length 3.5 mm (♂) *californicus* (Stal)

Dicyphus agilis Uhler
Figs. 84, 89

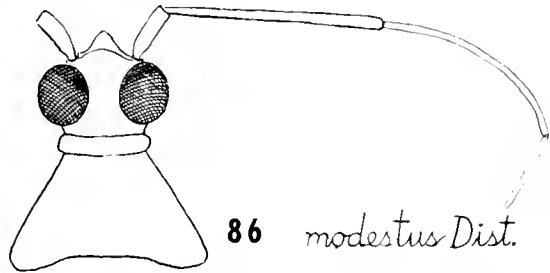
Idolocoris agilis Uhler, 1877:425.
This species was described from Colorado,
and the illustration of the male claspers (Fig.
89) was drawn from a specimen taken near



84 *agilis* Uhler



85 *separatus* Uhler



86 *modestus* Dist.

Figs. 84-86. Head and pronotum, 84, *Dicyphus agilis*;
85, *Macrolophus separatus*; 86, *Cyrtopeltis modestus*.

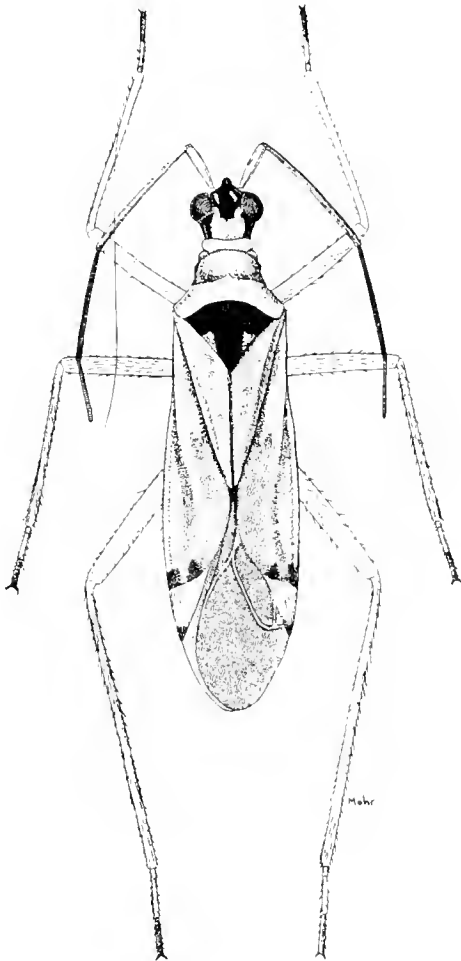


Fig. 87. *Dicyphus gracilentus*.

the type locality, one that agrees perfectly with the original description. A few related species have been mixed in with the published records of *agilis* Uhler, so all material needs reworking and determinations made on the basis of genital segment and claspers. The new species *ribesi* described in the present paper is closely related as shown in the claspers and general characters,

but the differences found in length of antennal segments and in form of the small right clasper may be used to separate these two species. On the basis of these characters I have determined the following specimens from Colorado as *agilis* Uhler: 6♂ ♀ July 10, 1964, Estes Park; 4♂ 2♀ July 18, 1964, Steamboat Springs; ♂ ♀ Aug. 7, 1925, Stonewall near Trinidad (H. H. Knight).

Dicyphus californicus (Stal)

Fig. 92

Capsus californicus Stal, 1859:259.

Dicyphus californicus Reuter, 1876:82.

Dicyphus californicus Van Duzee, 1914:25.

Recorded by Van Duzee in San Mateo County, Los Altos and Santa Cruz County, California; "Common everywhere on tarweed."

Dicyphus rufescens Van Duzee

Dicyphus rufescens Van Duzee, 1917:268.

Recorded from Wawona and Alpine, San Diego County, California.

Dicyphus disclusus Van Duzee

Fig. 95

Dicyphus disclusus Van Duzee, 1923:152.

Described from San Lorenzo Island, Gulf of California, where it was breeding on *Solanum hindsonianum*.

Dicyphus crudus Van Duzee

Fig. 93

Dicyphus crudus Van Duzee, 1916:240.

Described from Fallen Leaf Lake, near Tahoe, California. The figure of the male clasper was made from the holotype when I visited and studied types at the California Academy of Sciences in 1931.

Dicyphus pallicornis (Fieber)

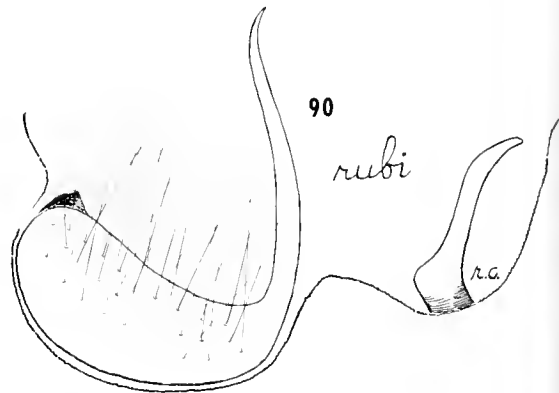
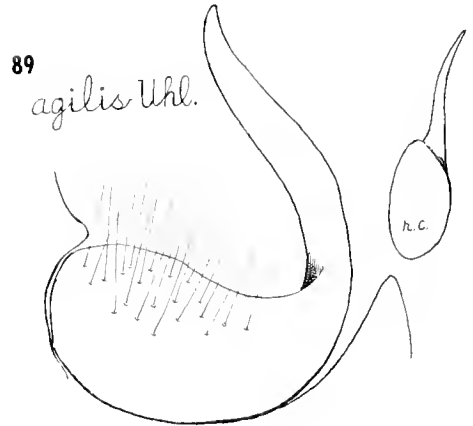
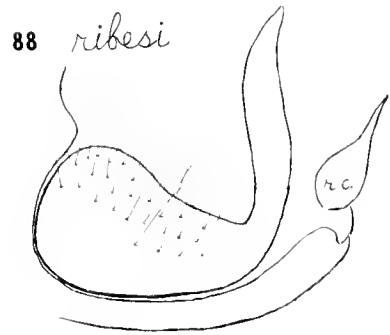
Brachyceraca pallicornis Fieber, 1861:324.

Dicyphus pallicornis Saunders, 1875:285.

Dicyphus pallidicornis Reuter, 1883:423, Pl. 3, Fig. 6.

Dicyphus pallicornis Carvalho, 1958:198.

This species is now recognized from the Pacific coastal area. 5♂ ♀ July 24, 1948, Victoria, British Columbia (W. Downes), host *Digitalis purpurea*. ♂ ♀ June 20, 1939, Sumner, Washington (R. Schopp), on *Digitalis purpurea*.



Figs. 88-90. ♂ claspers. 88, *Dicyphus ribesi*; 89, *D. agilis* Uhl.; 90, *D. rubi*.

Dicyphus ribesi, new species

Fig. 88

Allied to *californicus* (Stal) but differs in color aspect, and by structure of male claspers (Fig. 88).

Male. Length 3.7 mm, width .88 mm. Head: width .54 mm, vertex .26 mm; black, shining, a small pale spot each side of vertex and in contact with eye, extending upon base of vertex. Rostrum, length 1.19 mm, reaching upon apex of middle coxae, pallid, apex fuscous. Antennae: segment I, length .28 mm, fuscous to black; II, .95 mm, fuscous, slightly darker at base, eyelin-

drical, slightly more slender on basal half; III, .81 mm, fuscous; IV, .37 mm, fuscous. Pronotum, length .51 mm, width at base .82 mm; black, collar white, a broad spot on median line of disk behind calli, pallid. Scutellum and mesonotum black. Hemelytra pallid, translucent, apical half of clavus and narrow inner margin of corium, red; a small black spot on outer half of apex of corium; cuneus pallid, apex fuscous, the narrow paracuneus reddish. Membrane dusky to nearly clear, veins pale fuscous. Dorsal surface set with rather short, not crowded, suberect, pallid pubescence. Ventral surface black, shining. Legs, except bases of coxae, pallid, femora tinged with yellow, apical half becoming dusky; hind femora with median line of six or seven fuscous spots on anterior aspect, also two rows of small dots on posterior aspect; tibiae and tarsi dusky to pale fuscous. Male genital segment and left clasper (Fig. 88) distinctive of the species.

Female. Length 4.1 mm, width 1.0 mm. Head: width .59 mm, vertex .32 mm. Antennae: segment I, length .30 mm, black; II, .85 mm, black, apical half fuscous to pallid, slightly more slender on basal half; III, .92 mm, pallid to dusky; IV, .41 mm, dusky. Pronotum, length .92 mm, width at base .92 mm. Slightly larger than the male but very similar in color and pubescence.

Holotype: ♂ Aug. 11, 1965, Area 12M, Nevada Test Site (J. M. Merino); collected on *Ribes*. **Allotype:** ♀ same data as the type. **Paratypes:** 5♂ 18♀ taken with the types on *Ribes*. ♀ July 7, 1965, Area 18M (Mercury), Nevada Test Site (D E. Beck & J. M. Merino). 5♀ Aug. 13, Area 12M; 6♀ Aug. 24, Area 12M, Nevada Test Site (J. M. Merino), taken on *Ribes*.

Dicyphus phaceliae, new species

Allied to *californicus* (Stal), but distinguished by the longer antennal segments; segment II distinctly longer than width of pronotum at base.

Female. Length 4.2 mm, width 1.15 mm. Head: width .64 mm, vertex .34 mm; black, shining, a triangular pallid spot each side of vertex. Antennae: segment I, length .31 mm, pallid, basal half black; II, 1.1 mm, cylindrical, pale yellowish, basal half fuscous to black; III, 1.2 mm, yellowish brown, length equal to segment II; IV, .48 mm, yellowish. Rostrum, length 1.7 mm, reaching to middle of hind coxae, pallid, fuscous on base and apex. Pronotum, length

.72 mm, width at base .98 mm; collar white, sharply narrowed at middle above; calli distinctly convex, pallid between, and just behind this a round yellow spot on the black disk. Scutellum and mesoscutum black. Dorsal surface clothed with suberect, pale yellowish hairs. Hemelytra translucent, apical area of corium and embolium bright hypodermal red; clavus with narrow margin bordering scutellum and commissure, red; cuneus subtranslucent, apex fuscous. Membrane uniformly pale fumate, veins yellowish brown. Ventral surface brownish to black; ventral surface of abdomen pallid to yellowish white, sides fuscous brown. Legs pallid to yellowish, coxae brownish black at base; femora brownish yellow, spots not evident; tibiae yellowish brown, knees and tips of tarsi fuscous.

Holotype: ♀ July 4, 1935, Mt. Hume Creek, San Bernardino Mts. California (Timberlake, collector), taken on *Phacelia ramosissima*.

Dicyphus diplaci, new species

Fig. 91

Distinguished in the key by the long second antennal segment of the male; females distinguished by the pallid scutellum but with median line black; cuneus without black spot on apex.

Male. Length 3.0 mm, width .76 mm. Head: width .48 mm, vertex .24 mm; black, shining, a paler spot on vertex by margin of eye. Antennae: segment I, length .25 mm, fuscous to black; II, 1.0 mm, cylindrical, uniformly dark fuscous; III, .88 mm, fuscous; IV, .28 mm, fuscous. Rostrum, length .92 mm, reaching upon middle coxae, pallid, apex fuscous. Pronotum, length .44 mm, width at base .68 mm; black, collar white. Scutellum and mesonotum black. Dorsal surface clothed with rather short, recumbent, pale pubescent hairs. Hemelytra translucent, pallid to dusky, apical half of clavus tinged with brownish; cuneus and corium uniformly pallid translucent, no fuscous marks indicated. Membrane clear, veins pale fumate. Ventral surface brownish black, abdomen slightly paler on ventral surface. Legs pallid, femora dusky brown; tibiae pale to fuscous to brownish. Male claspers small, but left clasper distinctive, (Fig. 91).

Female. Length 4.1 mm, width 1.2 mm. Head: width .61 mm, vertex .31 mm. Antennae: segment I, length .27 mm, brownish black; II, .95 mm, cylindrical, black; III, .78 mm, brownish black; IV, .37 mm, pale fuscous. Pronotum

length .58 mm, width at base .92 mm; black, collar white, becoming pallid between calli and on median line of disk. Scutellum pallid, but with median line black. Slightly larger than the male but very similar in pubescence and color, except the scutellum pallid and median line black. Some specimens may show an accumulation of red on inner margin of corium, similar to *ribesi*; but differs in the pallid scutellum and median line black. In the large series of *ribesi* examined, not a single specimen shows any variation from the black scutellum.

Holotype: ♂ April 18, 1935, Whittier, California (E. L. Paddock), taken on *Diplacus longifloris*. **Allotype:** ♀ same data as the type. **Paratypes:** ♂ ♀ taken with the types on *Diplacus longifloris*.

Dicyphus rubi, new species

Figs. 28, 29, 90

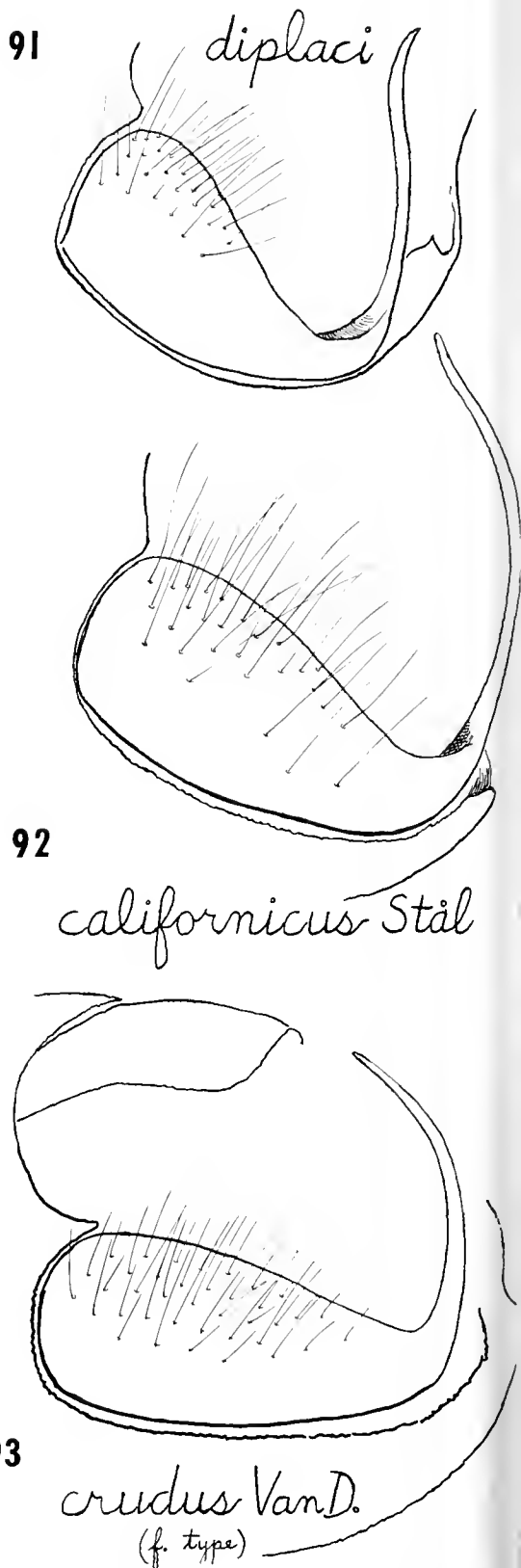
Dicyphus agilis Knight, 1923:477, not Uhler.

Dicyphus agilis Knight, 1941:53, not Uhler.

Allied to *agilis* (Uhler), but differs as shown in the key; male genital segment and claspers distinctive (Fig. 90), the right clasper distinctive in form, the left more slender on apical half and set at a different angle than *agilis* (Uhler).

Male. Length 4.3 mm, width .95 mm. Head: width .54 mm, vertex .24 mm; black, vertex with a pale spot each side. Rostrum, length 1.53 mm, reaching apex of middle coxae, pallid. Antennae: segment I, length .38 mm, pallid; II, 1.6 mm, cylindrical, fuscous to black; III, 1.4 mm, pale yellowish, basal fourth fuscous; IV, .54 mm, yellowish. Pronotum, length .71 mm, width at base .98 mm; black, sometimes paler between the calli, collar white, somewhat flattened. Scutellum black, mesonotum widely exposed, black, with pale spot at each side. Hemelytra pallid, subtranslucent, a blackish spot at tip of embolium and outer apical angle of corium, cuneus pallid to yellowish; membrane pale, translucent, veins pale to fuscous brown. Dorsal surface clothed with recumbent, pale to yellowish simple pubescence. Ventral surface fuscous brown. Legs pale to dusky, pubescence and spines pallid. Genital segment and claspers distinctive (Fig. 90).

Female. Length 4.6 mm, width 1.2 mm. Head: width .61 mm, vertex .30 mm. Rostrum, length 1.6 mm, reaching upon apex of middle coxae. Antennae: segment I, length .37 mm, pallid; II, 1.29 mm, fuscous to black; III, 1.3 mm, yellowish, fuscous on basal fourth; IV, .52 mm,



Figs. 91-93. ♂ left clasper. 91, *Dicyphus diplaci*; 92, *D. californicus*; 93, *D. crudus*.

yellowish. Pronotum, length .71 mm, width at base .98 mm. More robust than the male but very similar in color and pubescence.

Holotype: ♂ July 2, 1920, Ithaca, New York (H. H. Knight). **Allotype:** ♀ same data as the type. **Paratypes:** 6♂ 12♀ taken with the types on *Rubus odoratus*, host plant of the species.

Dicyphus hesperus Knight

Dicyphus hesperus Knight 1943:56.

One specimen was collected at the test site: ♀ June 17, 1965, Area MT.

This species occurs widely from Colorado, Wyoming, Idaho, and Utah to California. I have determined specimens from San Diego County, California (J. C. Bradley); also ♂ ♀ July 4, 1935, Arbolado; 3♂ May 7, 1935, San Gabriel River, California (E. L. Paddock), taken on *Stachys albens*. 4♀ May 16, 1935, Whittier, California (E. L. Paddock), taken on *Verbas-cum virgatum*.

Dicyphus paddocki, new species

Fig. 96

Allied to *pallicornis* (Fieber) but distinguished by the annulate first antennal segment, and segment II black on apex, also with collar width reduced at dorsal median line of pronotum.

Female. Length 4.1 mm, width 1.3 mm. Head: width .64 mm, vertex .27 mm; eyes large, brown; pallid, lora, geminate mark on basal half of clypeus, a broad band each side of frons, and spot each side of vertex, blackish. Antennae: segment I, length .34 mm, pallid, annulus at base and on apex, reddish brown; III, .92 mm, cylindrical, pallid, wide band on apex, reddish brown; III, .61 mm, fuscous, base pallid; IV, .27 mm, fuscous. Rostrum, length 1.6 mm, reaching upon apex of hind coxae, pallid, apex fuscous. Pronotum, length .64 mm, width at base 1.15 mm; basal margin broadly sulcate, also dorsal margin of collar sharply narrowed by one-third of the width on either side of median line above; calli fuscous, basal margin deeply impressed; disk pallid, basal angles narrowly infuscated. Mesonotum fuscous, pale spot each side; scutellum pallid, apex and geminate mark on basal half, fuscous. Dorsal surface sparsely clothed with rather long, suberect, pale to golden hairs. Hemelytra pallid, subtranslucent, apex of embolium and apex of cuneus fuscous; membrane and veins fumate to pale fuscous. Ventral sur-

face pallid, mesosternum fuscous; ostiolar peritreme strongly convex, nearly white, ostiole at middle of lower half, a narrow, smooth, dorsal curving reddish line extends from ostiole to near dorsal margin of peritreme. Venter pallid to yellowish, lateral margins somewhat reddish. Legs pallid, femora rather slender, with a row of 7 or 8 fuscous spots on anterior face.

Male. Length 4.2 mm, width 1.1 mm. Head: width .63 mm, vertex .27 mm. Antennae: segment I, length .36 mm, base and annulus at apex, reddish brown; II, 1.12 mm, fuscous near base, and on apical fourth; III, .61 mm, fuscous, pale at base; IV, broken. Rostrum, length 1.5 mm, reaching upon hind coxae. Pronotum, length .62 mm, width at base 1.0 mm; collar narrowed above at median line. Color and pubescence very similar to that of the female.

Holotype: ♀ Aug. 16, 1935, El Modeno, California (E. L. Paddock); named for the collector. **Allotype:** ♂ June 11, 1918, collected on sand spit at False Bay, California (C. L. Hubbs).

Dicyphus usingeri Knight

Dicyphus usingeri Knight, 1943:53.

Known from Camino, Calaveras, Tuolumne, Trinity, and El Dorado counties, California. Breeds on Mountain Misery, *Chamaebatia foliosa* Benth., according to Dr. Usinger.

Dicyphus rivalis Knight

Dicyphus rivalis Knight, 1943:54.

Known from California and Oregon.

Dicyphus tinctus Knight

Dicyphus tinctus Knight, 1943:55.

Known from the Rainier National Forest, Washington.

Dicyphus elongatus Van Duzee

Dicyphus elongatus Van Duzee, 1917:269.

Known from California, Washington and British Columbia.

Dicyphus brachypterus Knight

Dicyphus brachypterus Knight, 1943:53.

Both males and females have short hemelytra which do not reach apex of abdomen.

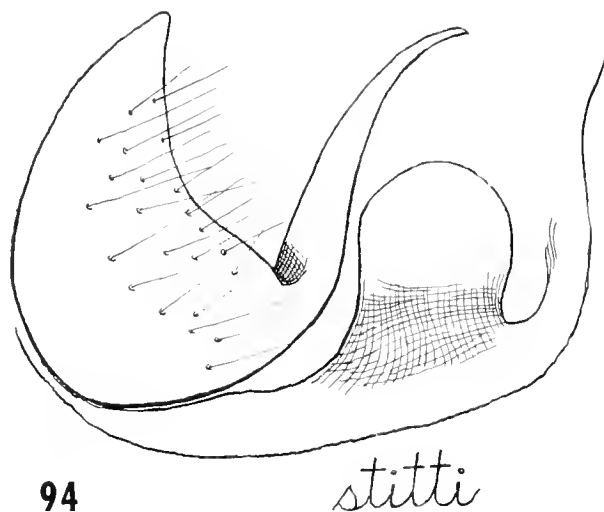


Fig. 94. *Dicyphus stitti*, ♂ left clasper.

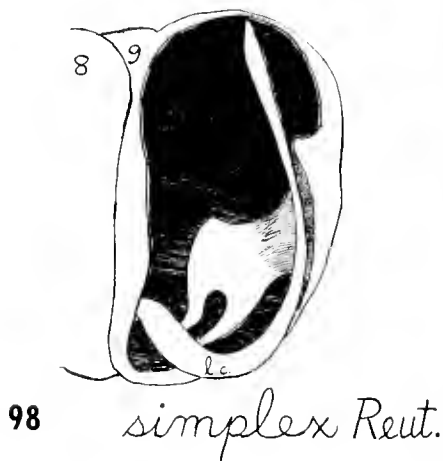
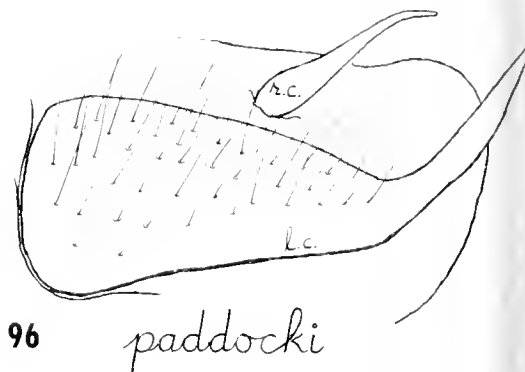
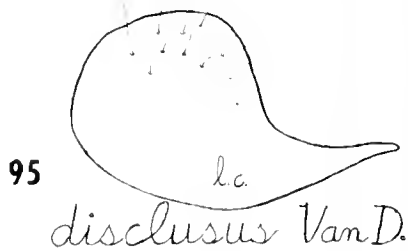
Known only from Mt. Ranier, Washington; breeds on *Polemonium humile*.

Dicyphus stitti, new species

Runs in the key to near *minimus* (Quaint.) in subgenus *Tupicoris*, but distinguished by the pallid hemelytra and length of second antennal segment not equal to width of pronotum at base.

Male. Length 3.1 mm, width .92 mm. Head: width .48 mm, vertex .28 mm; pallid, frons yellow, sometimes the vertex infuscated. Rostrum, length .98 mm, reaching upon base of middle coxae, pallid. Antennae: segment I, length .27 mm, pallid, with fuscous annulus on basal half; II, .85 mm, pale fuscous, basal half fuscous to black, cylindrical, length of pubescent hairs equal to thickness of segment; III, .78 mm, pale to dusky; IV, .41 mm, dusky. Pronotum, length .51 mm, width at base .98 mm; basal margin broadly concave, lateral margins abruptly concave beginning at basal angle, coxal clefts visible from above; disk pallid, calli and area about coxal cleft, yellow, collar nearly flat, pallid. Scutellum and mesonotum yellow, the latter broadly exposed. Dorsal surface clothed with rather short, suberect, pale pubescence. Hemelytra pallid, subtranslucent, costal margins subparallel, membrane and veins pallid; without spots or fuscous marks. Ventral surface and legs yellow, tibiae more pallid, apical segment of tarsi fuscous. Genital segment and claspers distinctive of the species (Fig. 94).

Female. Length 3.2 mm, width 1.02 mm. Head: width .51 mm, vertex .29 mm. Rostrum, length 1.02 mm, reaching upon middle coxae.



Figs. 95-98. 95, *Dicyphus disclusus*, ♂ left clasper; 96, *D. paddocki*, ♂ left clasper; 97, *D. minimus*, ♂ left clasper; 98, *Cyrtopeltis* (*Usingerella*) *simplex* (Reut.), ♂ genital segment.

Antennae: segment I, length .27 mm, pallid, fuscous annulus on middle of basal half; II, .62 mm, fuscous to black, paler on apical half; III, .68 mm, pale fuscous; IV, .40 mm, pale fuscous. Pronotum, length .51 mm, width at base .92 mm. Slightly more robust than the male, but very similar in color and pubescence.

Holotype: ♂ Oct. 6, 1940, Gila Bend, Arizona (L. L. Stitt). **Allotype:** ♀ taken with the type. **Paratypes:** 5♂ 4♀ and nymphs taken with the types on devil's claw, *Martynia parviflora*, where the species was breeding.

Dicyphus minimus Quaintance

Dicyphus minimus Quaintance, 1898:188, figs.
Dicyphus minimus Uhler, 1899:59.

This species is known from Florida, Texas and Arizona. The wild host plant of the bugs is *Nicotiana trigonophylla* in Arizona, and the same plant species occurs at the test site (Beatley, 1965). This insect has become an important pest of tomatoes in Arizona, and at Lerdo, Durango, Mexico (A. W. Morrill), where the tomato is grown commercially.

Genus *Macrolophus* Fieber

Macrolophus lopezi (Van Duzee)

Tylocapsus lopezi Van Duzee, 1923:152.

This species is distinguished by the short first antennal segment which in length does not equal width of vertex. Described from Lower California where it was taken on *Eucnide cordata* by Van Duzee.

Macrolophus mimuli, new species

Allied to *lopezi* (Van D.) but distinguished by the larger size, and length of first antennal segment greater than width of vertex.

Male. Length 3.1 mm, width .85 mm. Head: width .38 mm, vertex .20 mm; black, a pale median line on vertex. Rostrum, length 1.2 mm, reaching upon middle of hind coxae, pale yellow. Antennae: segment I, length .29 mm, thickness .07 mm, black; II, .72 mm, cylindrical, thickness .04 mm, pale yellow; III, .51 mm, dusky yellow; IV, .36 mm, fuscous. Pronotum, length .47 mm, width at base .68 mm, basal margin sulcate; black, median line of disk pale at base. Scutellum and mesoscutum black. Dorsal surface set with suberect, simple yellowish hairs. Hemelytra dull brownish black, basal half of corium,

two-thirds of embolium, and outer apical angle of corium clear translucent; cuneus clear translucent, apex and the paracuneus black. Membrane brownish black, a large rounded clear spot behind cuneus and larger areole. Ventral surface black. Legs except outer base of coxae, pallid to pale yellowish; tibial spines rather short, yellowish; tips of tarsi fuscous. Male claspers distinctive.

Female. Length 2.8 mm, width .74 mm. Head: width .36 mm, vertex .20 mm. Rostrum, length 1.18 mm, reaching upon apex of hind coxae. Antennae: segment I, length .28 mm, black; II, .61 mm, pale yellow; III, .52 mm; IV, .53 mm. Coloration and pubescence very similar to male.

Holotype: ♂ June 14, 1928, alt. 6000 ft, Huachuca Mts., Arizona (A. A. Nichol). **Allotype:** ♀ taken with the type. **Paratypes:** 5♂ 10♀ taken with the types "breeding on *Mimulus cardinalis*" (A. A. Nichol). 3♀ May 27, 1928, alt. 3300 ft, Rincon Mts., Arizona (A. A. Nichol).

Genus *Cyrtopeltis* Fieber

Cyrtopeltis (*Engytatus*) *modestus* Distant

Fig. 86

Engytatus geniculatus Reuter, 1876:83.

Neosilia modesta Distant, 1893:447.

Cyrtopeltis varians Reuter, nec Distant, 1909:62.

Engytatus varians Reuter, nec Distant, 1910:151.

Cyrtopeltis varians Knight, nec Distant, 1922:65.

Cyrtopeltis varians Knight, 1941:53.

Cyrtopeltis modestus, Carvalho, 1958:186, cat.

This species has a wide distribution. Known from California and Arizona, where it is a pest on tomatoes. Also known from Texas, Mississippi, Florida, Puerto Rico, and Mexico.

Cyrtopeltis (*Usingerella*) *simplex* (Reuter)

Fig. 98

Cyrtopeltis simplex Reuter, 1909:63.

Cyrtopeltis simplex Knight, 1922:67.

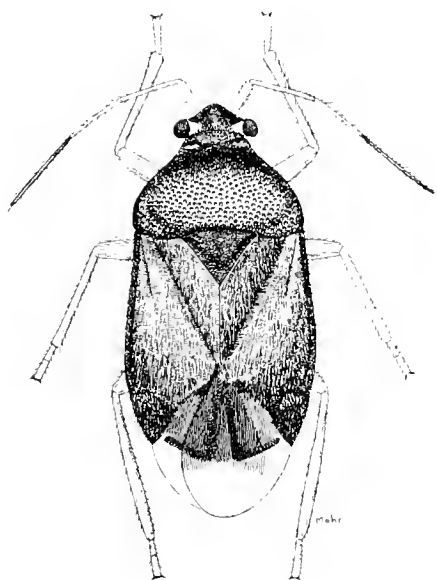
Cyrtopeltis (*Usingerella*) *simplex* China & Carvalho, 1952:165, figs.

This species was described from California. I also have specimens from Arizona, which were found breeding on *Mimulus cardinalis* by A. A. Nichol: ♂ ♀ June 14, 1928, alt. 6000 ft, Huachuca Mountains. The species is readily identified by the very large sickle-shaped left clasper.

Subfamily BRYOCORINAE

Key to the Genera

1. Small species, color black or bluish black with some orange or red coloring; males with a distinctive prong on left dorsal side of the genital segment 3
 - Small black species, some with pale in costal margins; male genital segment without prong on left margin 2
2. Embolium narrow and incrassate; hemelytra with rather long, semierect pubescence; pronotum posteriorly moderately inflated *Sixeonotus* Reut., p. 76
 - Embolium broadly expanded and flat; hemelytra with very fine, short and erect pubescence, surface with silvery spots; pronotum posteriorly greatly inflated *Pycnoderes* Guérin, p. 77
3. Calli strongly convex *Caulotops* Bergr., p. 78
 - Calli not strongly convex *Halticotoma* Reut., p. 77

Fig. 99. *Sixeonotus insignis* Reut., ♀.Genus *Sixeonotus* Reuter*Sixeonotus insignis* Reuter

Figs. 50, 99

Sixeonotus insignis Reuter, 1876:78, n. sp.*Sixeonotus insignis* Knight, 1941:59, Fig. 50.*Sixeonotus insignis* Carvalho, 1957:125.

Known from Arizona, Colorado, Texas and eastward.

Sixeonotus dextratus Knight*Sixeonotus dextratus* Knight, 1928:244.

This species was described from the Santa Catalina Mts., and from the Sabino Canyon, near Tucson, Arizona, where the species was

found breeding on pea vine, *Guardiola platyphylla*.*Sixeonotus nicholi* Knight*Sixeonotus nicholi* Knight, 1928:242.

Described from the Chiricahua Mts., Arizona.

Sixeonotus hebbiae, new speciesAllied to *albohirtus* Kngt., having all legs and antennae black, but differs in the finer and more densely punctate pronotum.

Female. Length 2.3 mm, width 1.2 mm. Head: width .73 mm, vertex .41 mm, black. Rostrum, length .64 mm, reaching upon middle coxae, black. Antennae: segment I, length .20 mm, black; II, .47 mm, cylindrical, more slender near base, black; III, broken. Pronotum, length .72 mm, width at base 1.08 mm, basal margin nearly straight, lateral margins just slightly sulcate as viewed from above; disk convex, finely and closely punctate, calli slightly elevated, uniformly black; clothed with rather short simple pubescence, and intermixed with appressed silvery sericeous pubescence. Scutellum impressed on middle of basal half, finely punctate, black. Hemelytra dull black, sparsely clothed with very fine, short, appressed silvery hairs, impunctate; cuneus turned sharply downward. Membrane fuscous, central area behind arcoles, milky white, veins black. Ventral surface black, clothed with short appressed, silvery pubescence. Legs brownish black, femora with somewhat longer pale hairs.

Male. Length 2.2 mm, width 1.1 mm. Rostrum length .54 mm, reaching to middle of inter-

mediate coxae. Head: width .68 mm, vertex .40 mm. Antennae: segment I, length .17 mm; II, .44 mm; III, broken. Pronotum, length .60 mm, width at base .95 mm. Very similar to the female in color, pubescence and puncturation.

Holotype: ♀ April 23, 1940, Mohawk, Arizona (L. L. Stitt). **Allotype:** ♂ same data as the type. **Paratypes:** 4♂ 5♀ taken with the types on *Bebbia juncea*, host plant of the species. 14 ♂ ♀ June 15, 1937, Yuma County, Arizona (L. L. Stitt), on *Bebbia juncea*.

Genus *Pycnoderes* Guérin-Ménéville

Pycnoderes quadrimaculatus
Guérin-Ménéville

Pycnoderes quadrimaculatus Guérin-Ménéville, 1857:169, Pl. 13, Fig. 13, n. sp.

Pycnoderes quadrimaculatus Carvalho, 1957: 123.

Many ♂ ♀ Oct. 25, 1922, Phoenix, Arizona, causing damage to beans, squash, and cucumbers.

Pycnoderes atratus (Distant)

Eccritotarsus atratus Distant, 1884:285, Pl. 26, Fig. 20.

Pycnoderes atratus Van Duzee, 1917:360, cat.
Pycnoderes atratus Carvalho, 1957:121, cat.

Known from Arizona, California, Texas, and Mexico.

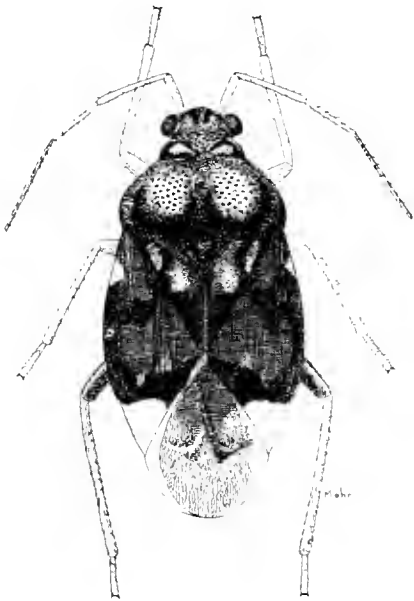


Fig. 100. *Pycnoderes medius* Kngt., ♀.

Genus *Halticotoma* Reuter

Key to the Species

- 1. Legs fuscous to black 4
- Legs yellowish to reddish brown 2
- 2. Hemelytra black to bluish black; antennal segment II equal to width of vertex or more..... 3
- Hemelytra yellowish brown; antennal segment II (♀) not equal to width of vertex *brunnea*, n. sp.
- 3. Antennal segment II, in length equal to width of vertex plus dorsal width of an eye; genital segment with a slender, acuminate horn projecting distad on the left side; length 3.4 mm *andrei*, n. sp.
- Antennal segment II, in length not equal to width of vertex plus dorsal width of an eye; genital segment with a thick blunt cornicle projecting distad on the left side; length 3.0 mm *valida* Reut.
- 4. Pronotum reddish orange; male genital segment with a lateral projecting long horn, visible from above; length 3-4 mm *cornifer* Kngt.
- Pronotum brownish black to black; male genital segment with a short blunt cornicle on the left side projecting dorsad *nicholi* Kngt.

Halticotoma valida Reuter*Halticotoma valida* Reuter, 1913:279.*Halticotoma valida* Van Duzee, 1917:359, cat.*Halticotoma valida* Knight, 1937:37, host, distr.

Head, pronotum and legs orange to red; hemelytra bluish black.

Known from Arizona, California, Utah, Colorado, Oklahoma, Texas and eastward. Breeds on *Yucca*.*Halticotoma nicholi* Knight*Halticotoma nicholi* Knight, 1928:242.This species is known from the Santa Rita Mts. and Huachuca Mts., Arizona, where A. A. Nichol found it breeding on *Nolina microcarpa*.*Halticotoma cornifer* Knight*Halticotoma cornifer* Knight, 1928:242.

This species was taken in Post Creek Canyon, Bonita, Arizona.

Halticotoma andrei, new speciesDistinguished from *valida* Reut. and all known members of the genus by the longer antennal segments; segment II equal to width of vertex plus dorsal width of an eye.

Male. Length 3.4 mm, width 1.5 mm. Head: width 1.02 mm, vertex .54 mm; orange red. Rostrum, length 1.22 mm, just reaching to middle of hind coxae, red, apex infuscated. Antennae: segment I, .54 mm, reddish black; II, .82 mm, cylindrical, thickness about two-thirds that of segment I, black, clothed with recumbent pale pubescence; III, .51 mm, black; IV, .34 mm, black. Pronotum, length .62 mm, width at base 1.32 mm, lateral margins sharply sulcate as viewed from above, disk rather closely punctate, calli convex, deeply impressed on inner anterior angles and between the calli, also with basal margins strongly impressed near lateral limits; color orange red; clothed with fine, simple, rather short pubescent hairs. Mesonotum widely exposed, red. Scutellum impressed on middle and base, red, apical area infuscated. Hemelytra brownish black, base of clavus reddish; clothed with recumbent to suberect, pale to yellowish

simple hairs, spacing of hairs ample, not crowded. Membrane and veins rather evenly shaded with fuscous brown. Ventral surface and legs rather uniformly orange red; tibiae light yellowish brown, tarsi fuscous brown. Genital segment distinctive; right clasper large, reaching around and across to top of left side, where a moderately long, rather slender, projecting, acuminate horn extends distad.

Holotype: ♂ Aug. 25, 1937, Clifton, Arizona (C. J. Drake & F. Andre). The species is named in honor of Dr. Floyd Andre, Dean of the College of Agriculture, Iowa State University, who was an active collector of insects in the early years, and retains his interest in systematic entomology, especially Thysanoptera.

Halticotoma brunnea, new species

Differs from other known members of the genus by the small size and uniformly yellowish brown color.

Female. Length 2.5 mm, width 1.4 mm. Head: width .81 mm; reddish brown. Rostrum, length 1.02 mm, reaching upon tips of hind coxae, reddish brown, apical half more fuscous brown. Antennae: segment I, length .24 mm, brown; II, .46 mm, cylindrical, orange brown, clothed with prominent, pale, suberect hairs; III, .34 mm, brown; IV, broken. Pronotum, length .68 mm, width at base 1.26 mm; lateral margins moderately sulcate, basal margin nearly straight, rounded near basal angles; disk and area before calli, rather closely punctate, calli moderately convex, smooth, with a pair of foveate punctures between inner angles; clothed with suberect yellowish hairs, color yellowish brown. Mesonotum fully covered by pronotal disk. Scutellum covered on base, disk depressed, yellowish brown, pale pubescent. Hemelytra yellowish brown, rather thickly clothed with suberect, pale yellowish hairs; membrane pale dusky brown, veins brown. Ventral surface yellowish to reddish brown, shining. Legs reddish brown, somewhat shining, tips of tarsi fuscous; hairs on femora suberect, rather prominent.

Holotype: ♀ June 26, 1932, Tieton Canyon, along Tieton River, Washington (A. R. Rolfs.)

Genus *Caulotops* Bergroth

Key to the Species

1. Length of antennal segment II (28) is greater than width of vertex plus dorsal width of an eye (26); length 4.6 mm *agavis* Reut.
- Length of antennal segment II (28) not equal to width of vertex plus dorsal width of an eye (32); length 5.2 mm. *barberi* Kngt.

Caulotops agavis Reuter

Caulotops agavis Reuter, 1909:1.

Described from the Galiuro Mts., Arizona, where the host plant was *Agave palmeri*.

Caulotops barberi Knight

Caulotops barberi Knight, 1926:101.

This species was described from the Huachuca Mts., Arizona.

6♂ ♀ June 12, 1928, Patagonia, Arizona (A. A. Nichol), breeding on *Agave*.

Subfamily HYALIODINAE

Genus *Hyaliodes* Reuter

Hyaliodes vitripennis (Say)

Capsus vitripennis Say, 1832:24.

Hyaliodes vitripennis Reuter, 1876:84.

Hyaliodes vitripennis Knight, 1941:57.

This species and two other members of the genus are widely distributed in states east of Colorado, but none is reported from the Great Basin.

Subfamily DERAEOCORINAE

Key to the Tribes

- 1. Anterior margin of pronotum with a distinct ringlike collar, set off by a definite constricted groove 2
- Anterior margin of pronotum without a ringlike collar, but set off by a dark impressed line running from antero-lateral angle back to posterior margin of calli, which are not strongly depressed LARGIDEINI, p. 83
- 2. Eyes distinctly removed forward from posterior margin of head; pronotum with calli represented by a smooth, depressed shining area, and this connected with anterior angles by a depressed line CLIVINEMINI, p. 83
- Eyes situated on posterior margin of head; pronotum with calli on level of adjacent areas of pronotal disk DERAEOCORINI, p. 79

Tribe DERAEOCORINI

Key to the Genera

- 1. Second antennal segment broad and distinctly flattened *Hesperophylum* Reut. & Popp., p. 80
- Second antennal segment cylindrical 2
- 2. Antennae linear, very long and of nearly equal thickness throughout; vertex transversely striate and longitudinally sulcate; second segment of hind tarsus much shorter than either first or third segments; usually large, elongate species *Eustictus* Reut., p. 82
- Antennae not so long or linear; second segment slender at base and slightly enlarged toward apex, third segment slender; vertex usually polished; second segment of hind tarsus as long as either first or third segments, or nearly so 3
- 3. Head strongly produced and nearly horizontal, facial angle acute, clypeus projecting beyond apex of first antennal segment; costal margin thin and broadly expanded *Eurychiloptera* Reut., p. 82
- Head less produced, scarcely surpassing middle of first antennal segment; facial angle either one of 90 degrees or only slightly less *Deraeocoris* Fieber, p. 80

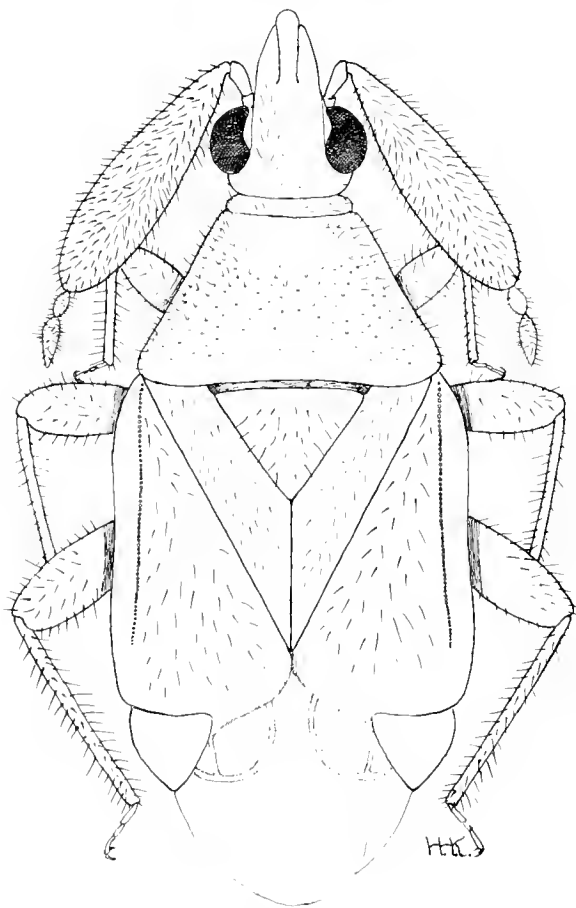
Genus *Hesperophylum* Reuter & Poppius*Hesperophylum heidemanni*
Reuter & Poppius*Hesperophylum heidemanni* Reuter & Poppius, 1912:17.*Hesperophylum heidemanni* Knight, 1941:74, Fig. 20.

This species is widely distributed but rarely collected. The form of the head with very long rostrum indicates it is a predaceous species; also we may add that predaceous forms are never as abundant as plant feeders. This species is known only from the District of Columbia, Iowa, and New Hampshire.

Hesperophylum arizonae, new species

Fig. 101

Allied to *heidemanni* Popp., but distinguished by the ivory white scutellum, the pronotal disk more finely punctate, collar more convex, the stricture distinct. Fig. 101.

Fig. 101. *Hesperophylum arizonae*, ♀.

Female. Length 3.0 mm, width 1.15 mm. Head: width .52 mm, vertex .27 mm, elongate, as shown in figure. Rostrum, length 1.83 mm, reaching upon fourth ventral segment, pale to brown, fourth segment paler than segment III. Antennae: segment I, length .17 mm, not reaching to apex of clypeus, brownish black; II, 1.02 mm, width .26 mm, much flattened but dorsal surface distinctly convex, brownish black, shining, with moderately long, suberect pubescence; III, .10 mm, thickness .034 mm, pallid; IV, .17 mm, thickness .034 mm, apex rather sharp, pallid. Pronotum, length .68 mm, width at base 1.02 mm, collar moderately convex, stricture distinct, calli evident by the granular surface; disk moderately convex, more flattened near base, rather finely but distinctly punctate, more finely and sparsely punctate on basal third; brownish black, pleura yellowish brown, ventral half ivory white, coxal cleft prominent, somewhat protruding, longitudinally impressed across top edge; dorsal surface bearing erect pale hairs, longer on lateral margins. Scutellum uniformly ivory white, rather strongly convex, but flat on discal area; finely but sparsely pubescent, with a few longer, erect pale hairs each side. Hemelytra uniformly brownish black, shining, costal margins nearly straight, but slightly sulcate near middle; embolium flat, edge sharp, separated from corium by a deeply impressed line of coarse punctures; cuneus turned down rather sharply, membrane uniformly fuscous brown, veins translucent brown. Ventral surface uniformly dark brown. Thus far only female specimens are known in this genus.

Holotype: ♀ August 18, 1937, Atasco Mts., Arizona (H. M. Harris), author's collection.

Genus *Deraeocoris* Kirschbaum*Deraeocoris* (*Camptobrochis*) *brevis*
(Uhler)*Camptobrochis brevis* Uhler, 1904:359.*Deraeocoris* (*Camptobrochis*) *brevis* Knight, 1921:90, key.

Records from the Nevada Test Site: Area 19M, ♂ June 22, 1965 (H. H. Knight & J. M. Merino); Area 12M, ♂ Aug. 25, 1965 (J. M. Merino).

This species occurs frequently on *Artemisia*, and is known from California; Ormsby County, Nevada (C. F. Baker); Utah, and Colorado.

Deracocoris (Camptobrochis) bakeri
Knight

Deracocoris (Camptobrochis) bakeri Knight, 1921:102, key.

Records from the Nevada Test Site: Area 401M, ♀ June 22, 1965 (H. H. Knight & J. M. Merino); Area 12M, ♂ Aug. 25, 1965 (J. M. Merino), on *Chrysothamnus viscidiflorus*; Area 17M, ♂ ♀ Aug. 5, 1965 (J. M. Merino), on *C. viscidiflorus*.

This species was described from Ormsby County, Nevada, and known now from Arizona, California, Utah, and Colorado. It is found most frequently on *Chrysothamnus*.

Deracocoris (Camptobrochis) validus
(Reuter)

Camptobrochis validus Reuter, 1909:58.

Deracocoris (Camptobrochis) validus Knight, 1921:108, key.

This species is known from California and Oregon.

Deracocoris (Camptobrochis) luridipes
Knight

Deracocoris (Camptobrochis) luridipes Knight, 1921:110, key.

Described from San Diego, California. Mr. Van Duzee collected the specimens on a plant he called an "Elderberry tree."

Deracocoris fulgidus (Van Duzee)

Camptobrochis fulgidus Van Duzee, 1914:21.

Deracocoris fulgidus Knight, 1921:149, key.

Records: San Diego, Lake, and Siskiyou Counties, California; Fort Collins, Colorado; 2♂ 4♀ June 30, 1964, Washoe County (R. C. Bechtel), on *Purshia tridentata*, ♂ ♀ June 30, 1964, Carson City (R. C. Bechtel), on *Purshia tridentata*, and ♀ June 29, 1964, Carson City, Ormsby County, Nevada (G. D. Cooney).

Deracocoris convexulus Knight

Deracocoris convexulus Knight, 1921:148, key.

Described and known only from Los Angeles County, California.

Deracocoris manitou (Van Duzee)

Camptobrochys manitou Van Duzee, 1920:355.

Deracocoris manitou Knight, 1921:153, key.

Known from Arizona, Colorado, and New Mexico.

Deracocoris barberi Knight

Deracocoris barberi Knight, 1921:157, key.

Known from Arizona, Colorado, Montana, and New Mexico.

Deracocoris californicus Knight

Deracocoris californicus Knight, 1921:185, key.

Known from Los Angeles County, California.

Deracocoris cerachates Uhler

Deracocoris cerachates Uhler, 1894:265.

Deracocoris cerachates Knight, 1921:187, key.

Known from Santa Cruz County, California.

Deracocoris schwarzii (Uhler)
Fig. 102

Camptobrochis schwarzii Uhler, 1893:375.

Deracocoris schwarzii Knight, 1921:146.

Records from the Nevada Test Site: Area 401M, nymphs taken June 19, 1965, on *Artemisia tridentata*.

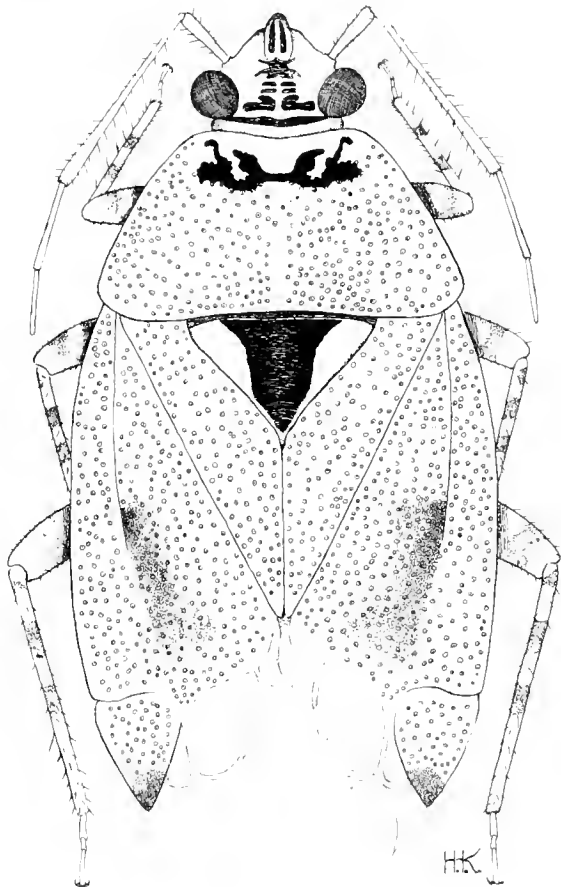


Fig. 102. *Deracocoris schwarzii* Uhler, ♂.

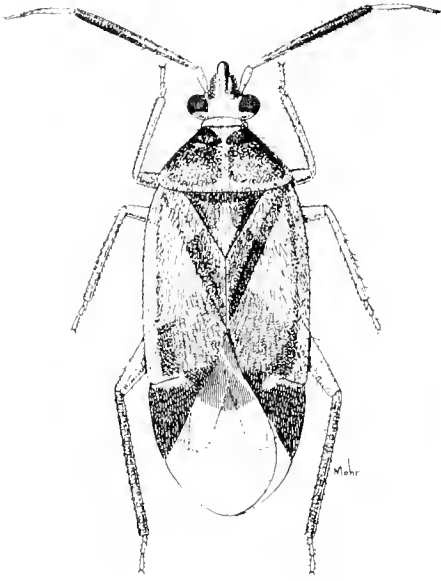


Fig. 103. *Eurychlopterella luridula* Reut., ♂.

These nymphs were identified by comparison with nymphs that were collected with adults on *Artemisia tridentata* at American Fork, Utah, the type locality for the species. At the test site I failed to return to the place of collection to obtain adults after emergence. On June 28, 1965, at American Fork, Utah, both nymphs and adults that were breeding on *Artemisia tridentata* were collected. Also collected was *schwarzii* on the same host, June 29, 1965, at Scipio and Cedar City, Utah.

Deraeocoris bullatus Knight

Deraeocoris bullatus Knight, 1921:147.

Records from the Nevada Test Site: Area TM, 4♂ 2♀ June 14, 1965, taken on *Purshia tridentata*; Area 6M, ♂ June 15, 1965; Area 401M, 3♂ 1♀ June 20, 1965, taken on *Purshia*.

The species *bullatus* was described from specimens taken on cliff rose, *Cowania mexicana*, at Grand View, Grand Canyon, Arizona, in 1917.

Genus *Eurychlopterella* Reuter

Eurychlopterella barberi Knight

Eurychlopterella barberi Knight, 1927:140.

This small species is known from the Huachuca Mts., Arizona. *Eurychlopterella luridula* Reut. (Fig. 103) is presented to show the characteristic form of members of this genus.

Genus *Eustictus* Reuter

Members of this genus are prowling, noc-

turnal predaceous types that are rarely taken by sweeping or beating vegetation. During the daytime they hide away in crevices or under loose bark, then become active at night. Most species have been collected around lights, and that appears to be the best place to find them. Several species have been collected in Arizona, and it seems highly probable that one or more species will eventually be taken at the Nevada Test Site.

Eustictus salicicola Knight

Fig. 104

Eustictus salicicola Knight, 1923:481.

Eustictus salicicola Knight, 1941:65.

Males of this species are distinguished by the extremely narrow vertex, which in width is subequal to thickness of first antennal segment; females are distinguished by the long pilose hairs on second antennal segment.

This species is known from Bear River, Utah, and appears to be widely distributed in the central United States.

Eustictus productus Knight

Eustictus productus Knight, 1925:38.

This species was described from Fort Huachuca, Arizona, and now recognized from Yuma County.

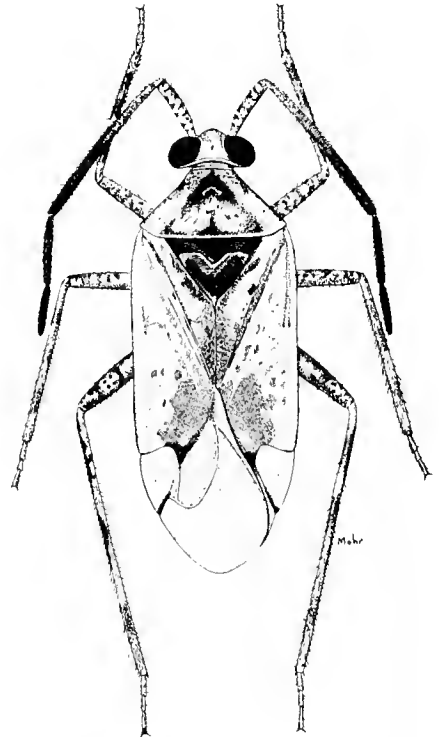


Fig. 104. *Eustictus salicicola* Kngt., ♀.

Eustictus morrisoni Knight

Eustictus morrisoni Knight, 1925:38.

This species was taken at Lewis Springs, Arizona.

Eustictus hirsutipes Knight

Eustictus hirsutipes Knight, 1925:39.

This species was taken at Texas Pass, Arizona, at light trap.

Eustictus obscurus Knight

Eustictus obscurus Knight, 1925:37.

This species was taken in Arizona and New Mexico.

Eustictus pusillus (Uhler)

Megacoelum pusillum Uhler, 1887:71.

This species is known from Arizona, Colorado, and Texas.

Tribe CLIVINEMINI

Key to the Genera

- 1. Membrane distinctly pubescent; collar not distinctly hooded over the head (Fig. 105) *Clivinema* Reuter, p. 83
- Membrane glabrous, or with extremely fine pubescence only; collar hooded or somewhat elevated above the head *Bothynotus* Fieber, p. 83

Genus *Bothynotus* Fieber

Bothynotus barberi Knight

Bothynotus barberi Knight, 1933:133.

Known from the Huachuca Mts., Arizona.

Clivinema sulcata Knight

Clivinema sulcata Knight, 1928:32, key.

This species is known from Palm Springs, California.

Genus *Clivinema* Reuter

Clivinema medialis Knight

Clivinema medialis Knight, 1928:31, key.

Described from American Fork, Utah. New record: ♀ June 24, 1966, White Pine County, Lehman Caves Nat. Monument, Nevada (W. Gagne).

Clivinema serica Knight

Clivinema serica Knight, 1928:34, key.

This species was described from Las Cruces, New Mexico, where it was reported "preying on *Orthezia*." Additional records: ♂ ♀ July 7-15, 1930, Richfield (E. W. Davis), at light; 2 ♀ June 30, 1965, St. George, Utah (H. H. Knight & A. H. Barnum). A key to the species is provided in the reference above.

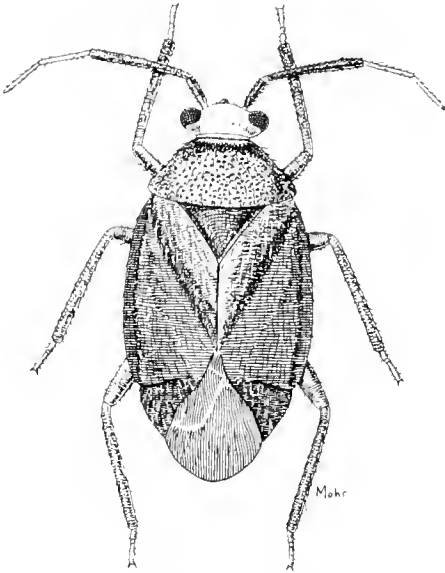


Fig. 105. *Bothynotus modestus* Wirt., ♂.

Tribe LARGIDEINI

Genus *Largidea* Van Duzee

Key to the Species

- 1. Rostrum not reaching beyond posterior margin of mesosternum 3
- Rostrum reaching between middle coxae, or to hind coxae 2

2. Femora black, without visible dots; length 4.7 mm *nevadensis*, n. sp.
Femora reddish brown, one or two rows of fuscous dots visible through the red color; length 4.2 mm *rubida* Uhler
3. Membrane conspurcate, with fuscous flecks and spots 4
Membrane not conspurcate, more or less shaded with fuscous but not broken into flecks and spots 5
4. Pronotal disk coarsely punctate; frons brown, without black marks of any kind; (♂) length 5.4 mm *arizonae*, n. sp.
Pronotal disk finely and closely punctate; frons with black arcuate band each side; (♀) length 6.4 mm *stitti*, n. sp.
5. Antennal segment II somewhat flattened, broadly lanceolate; length of segment I just equal to width of segment II; length 6.0 mm *grossa* Van D.
Width of antennal segment II not equal to length of segment I 6
6. Rostrum just reaching to middle of mesosternum; polished "lurid luteous-brown, tinged with red"; (♂) length 4.5 mm. *pucida* Van D.
Rostrum reaching beyond middle of mesosternum, but not beyond posterior margin 7
7. Thickness of antennal segment II barely exceeding thickness of segment I; length (♂) 4.7 mm, (♀) 5.2 mm *shoshonea*, n. sp.
Thickness of antennal segment II distinctly greater than thickness of segment I 8
8. Thickness of antennal segment II not equal to dorsal width of an eye; length (♀) 5.6 mm *gerhardi*, n. sp.
Thickness of antennal segment II just equal to dorsal width of an eye; length (♀) 5.8 mm *balli*, n. sp.

Largidea rubida (Uhler)

Clivinema rubida Uhler, 1904:355, n. sp.

Largidea marginata Van Duzee, 1912:481, n. sp.

Largidea rubida Knight, 1917:8, syn.

Largidea rubida Slater, 1950:59, Pl. 5, Fig. 2; Pl. 6, Fig. 2.

This species is known from Colorado, New Mexico, and northern Arizona. I have collected it on pines, *Pinus*, in Colorado and at Grand View, Grand Canyon, Arizona.

Largidea grossa Van Duzee

Largidea grossa Van Duzee, 1916:238.

This species was described from California, where a single female was taken on Jeffrey Pine, alt. 7000 ft, near Glen Alpine Springs (E. P. Van Duzee). Specimens are also known from Oregon and Washington.

Largidea pucida Van Duzee

Largidea pucida Van Duzee, 1925:397.

The species was described from Oregon and also reported from California.

Largidea nevadensis, new species

Fig. 106

Allied to *rubida* (Uhler), but distinguished by the black femora.

Male. Length 4.2 mm, width 1.6 mm. Head: width .92 mm, vertex .51 mm; black, eyes brown. Rostrum, length 1.46 mm, reaching upon apex of middle coxae, black. Antennae: segment I, length .22 mm, thickness .10 mm, black; II, 1.12 thicker than segment I, clothed with rather short, fine, pallid pubescence, intermixed with short black bristles, black; III, .23 mm, slender, black; IV, .30 mm, slightly longer than segment

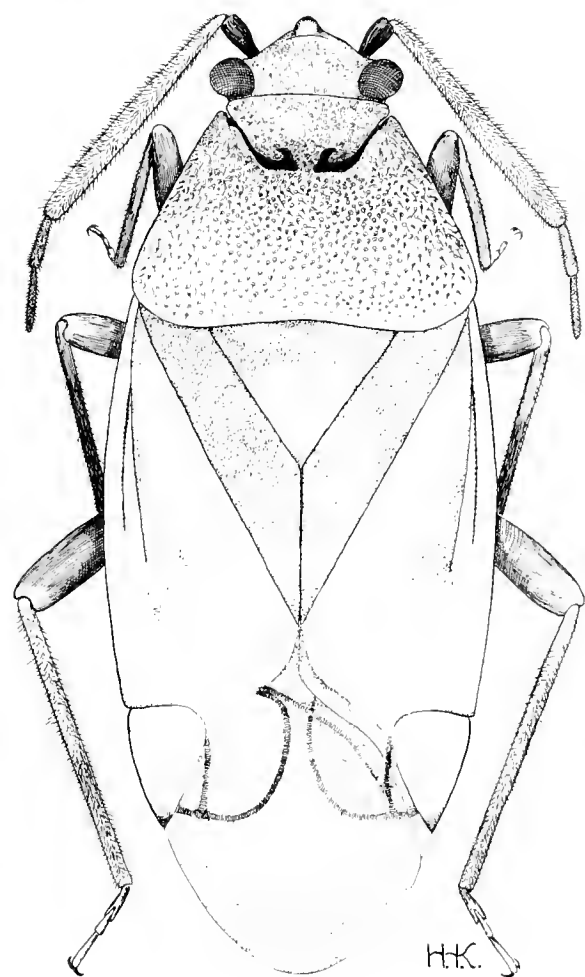


Fig. 106. *Largidea nevadensis*, ♀.

III, slender, black. Pronotum, length 1.05 mm, width at base 1.49 mm, basal angles well forward of posterior margin on median line; lateral margins straight, carinate; anterior margin elevated into a narrow collar, margin set off by transverse line just behind; disk coarsely punctate, reddish yellow, blackish about the calli; calli outlined by inner and basal margins of polished black, slightly impressed, forming a wide marginal line which is acutely angled at inner basal margin of each callus; outer margin of each callus with a glabrous line, but somewhat hidden by overlapping silvery, sericeous pubescence. This form of collar and calli rather distinctive for the genus. Scutellum moderately convex, transversely striate, irregularly punctate, yellowish, basal half black. Hemelytra with yellowish hypodermal color, clavus blackish, outer half of corium with fuscous, cuneus reddish yellow; membrane pale fuscous, veins dark fuscous.

Dorsal surface clothed with short, recumbent, pale pubescence, and intermixed around the calli and on the head with some silvery, sericeous pubescence. Ventral surface reddish yellow, sternum black, venter more reddish; claspers distinctive. Legs black, shining, femora without visible spots.

Female. Length 5.0 mm, width 2.0 mm. Head: width 1.02 mm, vertex .59 mm; black, yellowish about front margins of eyes. Antennae: segment I, length .27 mm, thickness .13 mm, black; II, 1.46 mm, gradually thicker on apical half, thickness .15 mm, black; III, .27 mm, black; IV, .34 mm, black, slightly more slender than III. Pronotum, length 1.19 mm, width at base 1.7 mm. Slightly more robust than the male but very similar in color and pubescence. Second antennal segment tapering from base to thicker on apical half, somewhat thicker than in the male.

Holotype: ♂ June 23, 1965, Area 18M, Nevada Test Site (H. H. Knight & J. M. Merino). **Allotype:** ♀ taken with the type on *Pinus monophylla*. **Paratypes:** 9♂ 10♀ taken with the types on *Pinus monophylla* (H. H. Knight & J. M. Merino). At this date nymphs and teneral adults were taken in the net. Also a good series of *Platylygus vanduzeei* were taken along with *Largidea*.

Largidea arizonae, new species

Belongs in the group with conspurcate membrane; allied to *stitti* but distinguished by the coarsely punctate pronotum.

Male. Length 5.1 mm, width 2.1 mm. Head: width 1.1 mm, vertex .64 mm, flat; eyes protrude above plane of vertex more than other species. Rostrum, length 1.26 mm, just reaching to posterior margin of mesosternum, dark brown. Antennae: segment I, length .30 mm, thickness .136 mm, dark brown; II, 1.8 mm, thickness .153 mm, cylindrical, short pubescent, dark reddish brown; III, .37 mm, slender, thickness .068 mm; IV, broken. Pronotum, length 1.42 mm, width at base 1.9 mm, disk coarsely and densely punctate, impunctate just between and before calli; lateral margins of disk straight, carinate; collar flat, only slightly elevated, lighter in color; calli brownish black, disk a rich dark brown color. Dorsal surface rich dark brown, scutellum darker; hemelytra subtranslucent, dark brown tinted with red; clothed with recumbent pale to yellowish hairs, intermixed with sericeous silvery hairs about the calli, on

the head and sides of thorax. Membrane conspurcate with fuscous brown spots and patches; veins dark reddish brown. Ventral surface yellowish brown to dark brown, genital segment reddish brown; claspers distinctive of the species. Legs light brown to dark brown, tibiae darker brown, tarsi blackish.

Holotype: ♂ July 26, 1917, Mt. Lemon, alt. 9000ft, Santa Catalina Mts., Arizona (H. H. Knight). I erroneously recorded this specimen as *Largidea grossa* Van Duzee (Knight, 1918) some years before I was able to see the type of that species.

Largidea stitti, new species

Allied to *arizonae* but differs in the shorter rostrum, and in the more finely and closely punctate pronotum; frons with an arcuate black band each side of middle.

Female. Length 6.5 mm, width 2.5 mm. Head: width 1.22 mm, vertex .75 mm, vertex and frons only moderately convex, dark brown; frons with an arcuate black band each side of middle. Rostrum, length 1.43 mm, just reaching upon middle of mesosternum, dark brown. Antennae: segment I, length .34 mm, thickness .17 mm, dark brown; II, 1.77 mm, clavate, base more slender than I, but becomes thicker from base to middle of apical half where thickness is .24 mm, dark brown, thickly clothed with suberect black hairs; III, .34 mm, slender, black; IV, .34 mm, more slender, black. Pronotum, length 1.49 mm, width at base 2.17 mm, basal angles well forward of posterior margin; lateral margins earinate, slightly sulcate, collar at anterior margin, flat; calli as described for *arizonae*; disk dark brown, rather finely and more punctate than in *arizonae*. Scutellum convex, more strongly on middle, impressed on middle at base; uniformly dark brown like the pronotum and hemelytra. Hemelytra uniformly dark brown, opaque; cuneus rich dark brown like the corium. Membrane conspurcate with spots and patches of dark fuscous brown, veins fuscous brown. Dorsal surface clothed with appressed, pale to yellowish simple hairs, and intermixed with silvery sericeous pubescence on head, about calli, and sides of the body. Ventral surface pallid to medium brown, sides of venter fuscous to black. Legs rather uniformly dark brown.

Holotype: ♀ Aug. 22, 1940, Long Valley, Arizona (L. L. Stitt), taken on *Pinus ponderosa*.

Largidea balli, new species

Allied to *gerhardi*, but differs in having a thicker second antennal segment as shown in the key.

Female. Length 5.8 mm, width 2.3 mm. Head: width 1.22 mm, vertex .71 mm; black, yellowish bordering the eyes. Rostrum, length 1.39 mm, reaching a little beyond middle of mesosternum, or half way between midpoint and posterior margin of mesosternum. Antennae: segment I, length .37 mm, thickness .13 mm, black; II, 1.49 mm, narrow at base where it is only two-thirds thickness of segment I, but thickness at middle .18 mm, and tapering off to .136 mm, on apex, black, clothed with suberect black, bristle-like hairs; III, .36 mm, thickness .068 mm, black; IV, .35 mm, black. Pronotum, length 1.46 mm, width at base 2.1 mm; disk coarsely punctate but punctures not crowded, lateral margins nearly straight, carinate; dark brown, black on calli and adjoining area, collar brown, with punctures on dorsal aspect. Scutellum moderately convex, impressed on middle at base. Hemelytra dark fuscous brown, clothed with recumbent to appressed pubescent hairs, intermixed with a few silvery sericeous hairs, but more abundant about calli, on head, and upon sides of thorax. Membrane dark fuscous, somewhat paler on middle, veins brownish black. Ventral surface fuscous to dark brown. Legs pale fuscous to reddish brown; femora reddish brown, anterior aspect with row of fuscous to black dots, posterior aspect with row of spots on middle, and a second row of 5 or 6 larger black spots below; tibiae brownish black, clothed with bristly hairs, true bristles intermixed.

Holotype: ♀ Aug. 9, 1930, San Francisco Mts., Arizona (E. D. Ball). Named in honor of Dr. E. D. Ball who was a well-known authority of Cicadellidae and Membracidae.

Largidea gerhardi, new species

Allied to *balli*, but second antennal segment more slender, thickness not equal to dorsal width of an eye.

Female. Length 5.6 mm, width 2.3 mm. Head: width 1.18 mm, vertex .74 mm; dark brown, a black band each side of frons and extending upon vertex. Rostrum, length 1.3 mm, reaching to slightly beyond middle of mesosternum, brownish black. Antennae: segment I, length .34 mm, thickness .136 mm, black; II, 1.49 mm, thickness at middle .17 mm, more

slender at base, tapering to slightly thinner on apex, thickness not equal to dorsal width of an eye (.20 mm), brownish black, clothed with rather short, suberect, brown pubescent hairs; III, .37 mm, black; IV, .32 mm, black. Pronotum, length 1.43 mm, width at base 2.0 mm; disk coarsely punctate, dark brown, calli black; lateral margins carinate, slightly sinuate. Scutellum moderately convex, apex somewhat flattened, dark fuscous brown. Dorsal surface dark fuscous brown, clothed with recumbent and appressed pale to silvery pubescence, and intermixed with silvery, sericeous pubescence, more abundantly on head, about calli, and sides of thorax. Hemelytra dark fuscous brown, opaque, cuneus color similar to corium; membrane fuscous, veins brownish black. Ventral surface fuscous brown to brownish black, sternum black. Legs dark fuscous brown, fuscous spots obscure or absent; tarsi black.

Holotype: ♀ July 22, 1909, Golden, Colorado (W. J. Gerhard) "on pine." Named for the collector, Mr. W. J. Gerhard, whom I knew many years ago when he was employed in the Entomology section of the old "Field Museum" in Chicago, Illinois.

Largidea shoshonea, new species

Allied to *gerhardi*, but antennal segment II more slender, thickness barely exceeding thickness of segment I.

Male. Length 4.7 mm, width 1.7 mm. Head: width 1.02 mm, vertex .59 mm; dark brown to black, paler brown bordering eyes, above and in front. Rostrum, length 1.29 mm, reaching posterior edge of mesosternum, dark brown. Antennae: segment I, length .24 mm, thickness .12 mm, brownish black; II, 1.22 mm, cylindrical,

thickness .13 mm, dark brown, clothed with short pale pubescence; III, .30 mm, slender, dark brown; IV, .34 mm, slender, brown. Pronotum, length 1.1 mm, width at base 1.6 mm; disk rather coarsely punctate behind calli and on central area, more finely near edges; lateral margins sulcate, carinate, more strongly at anterior angles; calli and collar typical for the genus. Scutellum moderately convex, impressed on median line at base, also transversely striate on basal half; dark brown. Hemelytra subtranslucent, dark brown, tinged with red on cuneus; clothed with recumbent to appressed, simple pale hairs, intermixed on basal half with a few silvery, sericeous hairs; also with sericeous hairs about the calli and on the head. Membrane pale fuscous, veins dark brown. Ventral surface brown to dark brown, reddish brown on coxae and genital segment. Legs dark reddish brown, tibiae nearly black.

Female. Length 5.2 mm, width 2.1 mm. Head: width 1.12 mm, vertex .70 mm. Rostrum, length 1.33 mm, reaching to posterior margin of mesosternum. Antennae: segment I, length .28 mm, thickness .12 mm; II, 1.29 mm, subcylindrical, thickness .12 mm, on middle, but tapering slightly more slender at base and on apex, clothed with suberect brown pubescence; III, .34 mm, slender; IV, .34 mm, dark brown. Pronotum, length 1.25 mm, width at base 1.87 mm. Color and pubescence very similar to the male; the antennae nearly the same but with small difference in segment II as shown above.

Holotype: ♂ Aug. 24, 1925, Estes Park Colorado (H. H. Knight). **Allotype:** ♀ Aug. 14, 1927, Shoshone National Forest, Wyoming (H. H. Knight), swept from lodgepole pine, *Pinus murrayana*. **Paratype:** ♀ Sept. 11, Bear Paw Mountain, Montana.

Subfamily ORTHOTYLINAE

Key to the Tribes

- 1. Eyes pedunculate, head very broad LABOPINI, p. 88
- Eyes not pedunculate, head not exceptionally broad 2
- 2. Pronotum with pleural area separated from dorsal part by a distinct suture above the coxal cleft; pronotal disk projecting loosely over base of scutellum SEMINI, p. 88
- Pronotum without distinct lateral suture 3
- 3. Small to medium sized, compact, black species with saltatorial femora HALTICINI, p. 88
- Not black species with saltatorial femora 4

4. Antlike species with abdomen more or less constricted at base
 PILOPHORINI, p. 159
 Body not antlike in form 5
5. Second, third and fourth segments of antennae subequal in thickness
 CERATOCAPSINI, p. 155
 Second antennal segment somewhat thicker than the third and fourth segments
 ORTHOTYLINI, p. 92

Tribe SEMINI

Genus *Semium* Reuter

Semium subglaber Knight

Semium subglaber Knight, 1927:26.

I have identified the following specimens from the test site: Area 18M, ♂ July 22, 1965; Area 19M, ♂ June 23, 1965; Area 401M, 2 ♀ June 18, 1965. Specimens were collected on *Euphorbia albomarginata*.

This species was described from Arizona (Knight, 1927), and was unknown elsewhere until the present study.

Tribe LABOPINI

Genus *Labops* Burmeister

Labops hesperius Uhler

Labops hesperius Uhler, 1872:416.

Labops hesperius Knight, 1922:258.

Labops hesperius Carvalho, 1958:19.

This species is known from Alberta, Oregon, Washington, Idaho, Montana, Utah, Colorado, and Wyoming.

Labops hirtus Knight

Fig. 60

Labops hirtus Knight, 1922:258.

Labops hirtus Knight, 1923:501, Fig. 19.

Labops hirtus Slater, 1954:62, figs.

This species is known from New York, Colorado, Wyoming, Montana, Idaho, Oregon, Washington, Alberta, and British Columbia.

A new record for Nevada is ♂ June 16, 1960, Canyon Creek, alt. 7000 ft, Humboldt County (F. D. Parker).

Labops utahensis Slater

Labops utahensis Slater, 1954:62, key, figs.

This species is known from Utah, and is probably limited in distribution to the Great Basin.

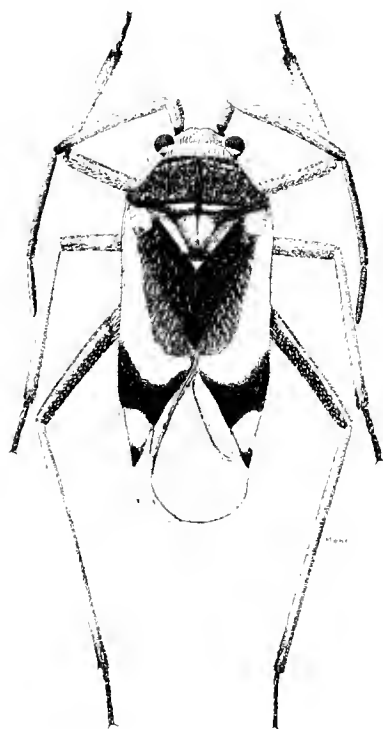


Fig. 107. *Semium hirtum* Rent., ♀.

Genus *Labopella* Knight

Labopella claripennis Knight

Fig. 108

Labopella claripennis Knight, 1929:215.

This species was described from a single female collected July 12, 1917, at Deming, New Mexico (H. H. Knight). Not until forty-eight years later was it taken again when a nice series was collected Aug. 15, 1965, at Fort Davis, Texas (J. C. Schaffner), around lights.

Tribe HALTICINI

Genus *Halticus* Hahn

Halticus intermedius Uhler

Fig. 56

Halticus intermedius Uhler, 1904:360.

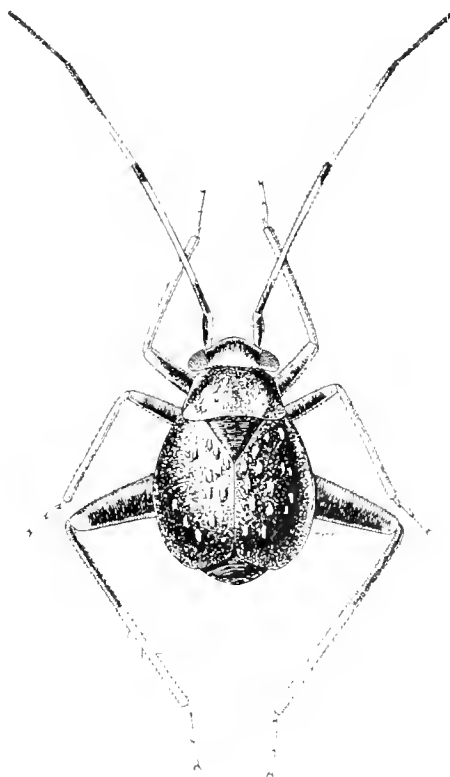
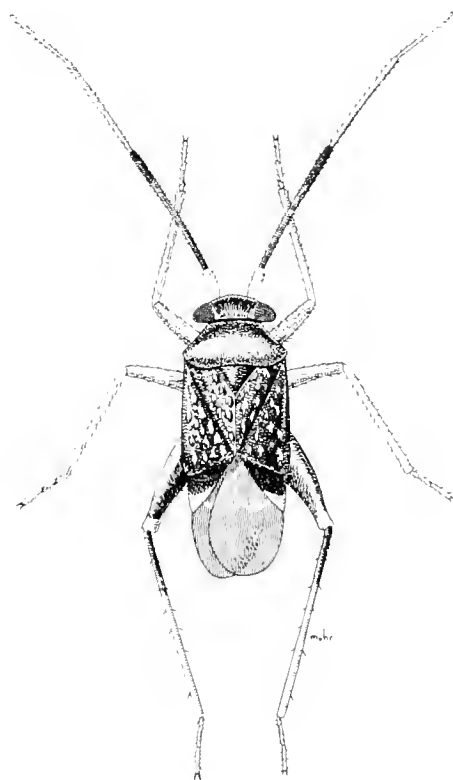
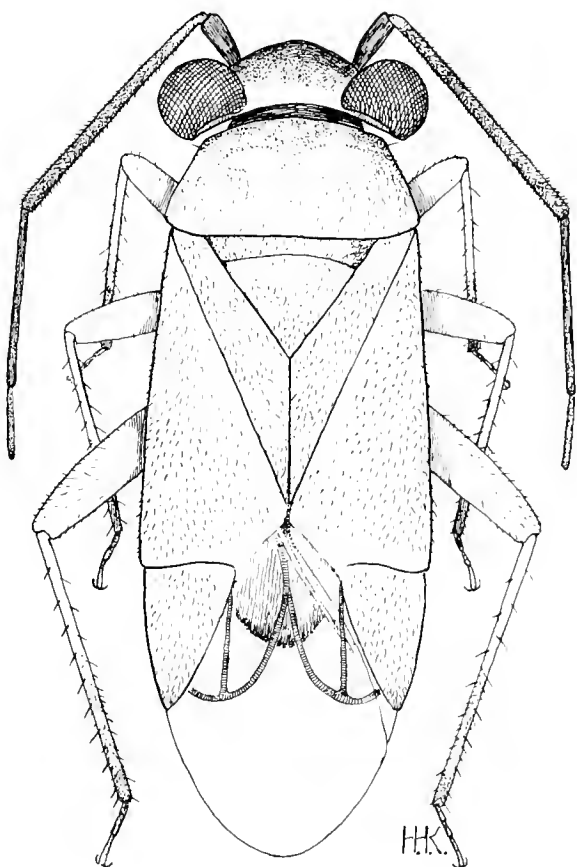


Fig. 108. *Labopella claripennis* Kngt. ♂ top. *Slaterocoris stygicus* ♂ bottom.

Fig. 109. *Halticus bracteatus* Say. ♂ top. ♀ bottom.

Halticus intermedius Knight, 1927:38.

This species is known from Colorado, New Mexico and states eastward. The host plant is *Clematis ligusticifolia*.

Genus *Slaterocoris* Wagner

Slaterocoris stygicus (Say)

Fig. 108

Capsus stygicus Say, 1832:24.

Strongylocoris stygicus Knight, 1941:79, Figs. 113, 114.

Slaterocoris stygicus Wagner, 1956:280, n. gen.

This is a widely distributed species, known from Alberta (Canada), Arizona, Colorado, Montana, South Dakota, Texas, Wyoming, and most of the eastern states. The host plant is goldenrod, *Solidago*.

Slaterocoris croceipes (Uhler)

Fig. 110

Stiphrosoma croceipes Uhler, 1893:373.

Strongylocoris croceipes Tucker, 1907:60.

Strongylocoris croceipes Knight, 1938:7, Pl. 1, Fig. 7.

Slaterocoris, new genus, Wagner, 1957:280.

The following records are known: Area 16M ♀ June 24, 1965; Area 18M, 7♂ 11♀ June 20, 1965, on *Chrysothamnus nauseosus*; Area 401M, 20♂ 14♀ June 18, 1965, on *Chrysothamnus nauseosus*; Area 12C1, ♂ June 18, 1964, Nevada Test Site. The type was collected at Los Angeles, California (Coquillett). 6♂ 7♀ Aug. 15, 1925, Dolores; 9♂ 10♀ Aug. 17, 1925, Gunnison, taken on *Chrysothamnus*; ♂ 3♀ Aug. 14, 1925, Mesa Verde Nat Park (H. H. Knight); ♂ Aug. 6, 1925, Las Animas (C. J. Drake); 2♂ 4♀ June 10, 1900, Fort Lupton, Colorado (E. D. Ball). 6♂ 9♀ June 28, 1965, American Fork, on *Chrysothamnus*; ♂ 2♀ June 29, 1965, Scipio; 3♂ 1♀ June 30, 1965, St. George, Utah (H. H. Knight), on *Chrysothamnus*.

Slaterocoris robustus (Uhler)

Fig. 112

Stiphrosoma robusta Uhler, 1895:45.

Strongylocoris robustus Tucker, 1907:60.

The following records are known: 105♂ ♀ July 11-16, 1964, Steamboat Springs, Colorado, (H. H. Knight), on *Artemisia tridentata* (type locality). 7♂ 2♀ June 29, 1965, Scipio, Utah (H. H. Knight), taken on *Artemisia*. 2♂ 3♀ July 29, 1965, Elko County, Nevada (R. C. Bechtel), on *Artemisia tridentata*.

Slaterocoris rubrofemoratus, new species

Fig. 111

Distinguished from allied species with black tibiae by having all femora red on apical half; also distinguished by structure of the male claspers (Fig. 111).

Male. Length 4.1 mm, width 1.7 mm. Head: width 1.08 mm, vertex .61 mm. Rostrum, length .88 mm, reaching upon middle coxae. Antennae: segment I, length .30 mm, black; II 1.02 mm, black, cylindrical, slightly thicker on apical half but not equal to thickness of segment I; III, .71 mm; IV, .30 mm; black. Pronotum, length .72 mm, width at base 1.4 mm; black, shining, finely and shallowly punctate. Dorsal surface black, shining; clothed with suberect, yellowish brown simple pubescence, hairs rather sparsely set on hemelytra; closely, finely and shallowly punctate. Hemelytra with costal margin only slightly arcuate, cuneus turned downward. Membrane rather uniformly dark fuscous, veins black, a narrow clear spot by apex of cuneus. Ventral surface black, shining. Legs black, apical half of femora ruby red; tibiae black but showing reddish on knees. Genital segment and claspers distinctive of the species (Fig. 111).

Female. Length 3.6 mm, width 1.9 mm; costal margin more strongly arcuate. Head: width 1.19 mm, vertex .71 mm. Antennae: segment I, length .28 mm; II, .88 mm; III, .68 mm; IV, .31 mm. Pronotum, length .78 mm, width at base 1.53 mm. More robust than the male but very similar in color and pubescence.

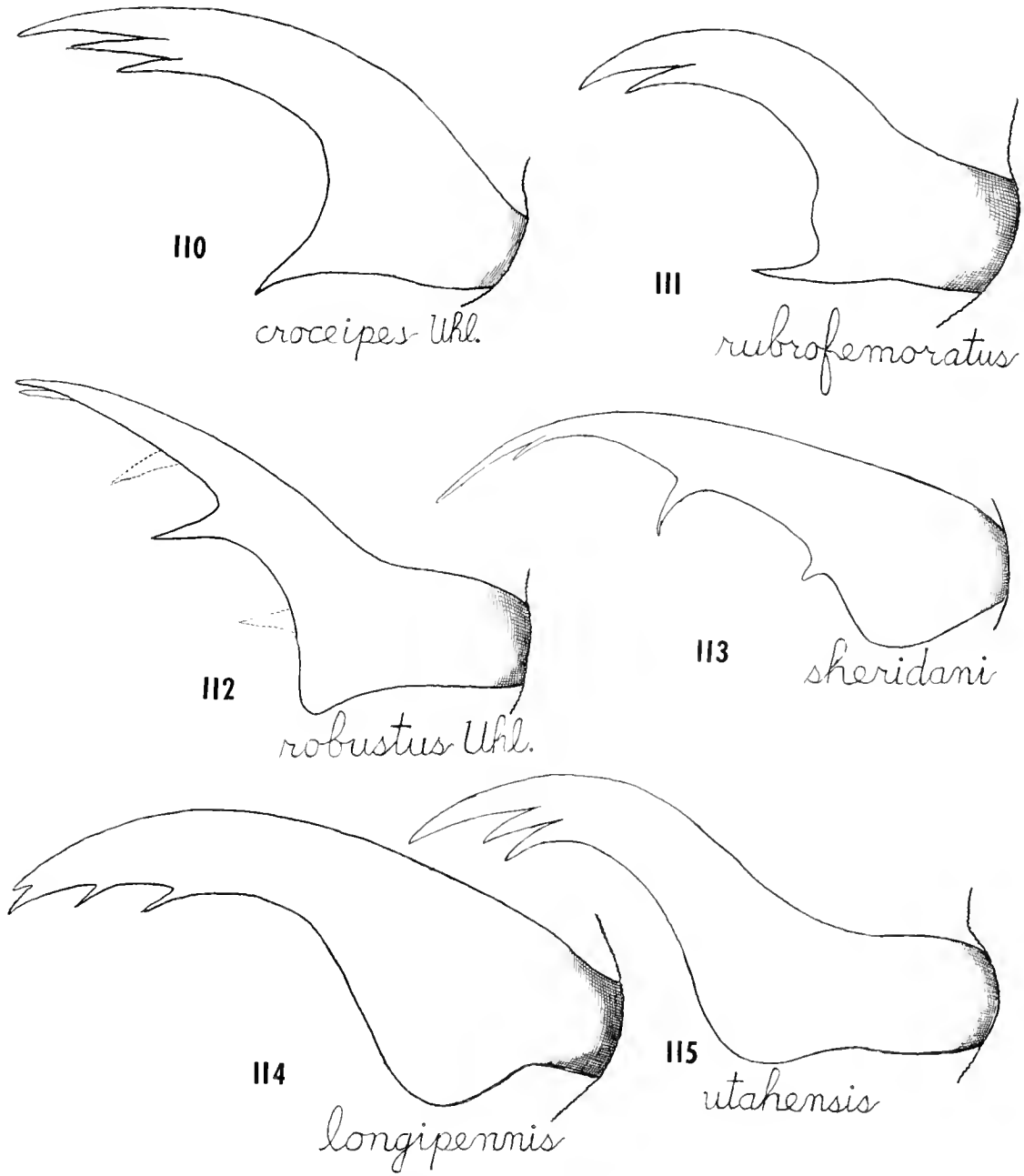
Holotype: ♂ June 22, 1965, Area 401M, Nevada Test Site (H. H. Knight & J. M. Merino). **Allotype:** ♀ June 19, 1965, Area 401M, Nevada Test Site. **Paratypes:** 4♂ 4♀ June 19, 3♂ 4♀ June 22, Area 401M; ♂ ♀ June 23, 1965, Area 19M, Nevada Test Site (H. H. Knight & J. M. Merino), taken on *Artemisia tridentata*. ♀ June 30, 1965, Dixie Park, St. George, Utah (H. H. Knight).

Slaterocoris longipennis, new species

Fig. 114

Distinguished from related species by the erect golden yellow pubescence, short rostrum, and the very long hemelytra of the male; male claspers distinctive (Fig. 114).

Male. Length 5.6 mm, width 2.0 mm. Head: width 1.08 mm, vertex .58 mm; black. Rostrum, length .92 mm, reaching posterior margin of mesosternum, or the base of front coxae. An-



Figs. 110-115. Right clasper of male. 110, *Slaterocoris croceipes* Uhl.; 111, *S. rubrofemoratus*; 112, *S. robustus* Uhl.; 113, *S. sheridani*; 114, *S. longipennis*; 115, *S. utahensis*.

tennae: black; segment I, length .30 mm; II, 1.19 mm, cylindrical, thickness almost equal to that of segment I, thickly clothed with long pubescence; III, .88 mm; IV, .34 mm. Pronotum, length .85 mm, width at base 1.53 mm; disk finely rugulose punctate, shining. Dorsal surface black, densely clothed with suberect and erect, long, pale to golden yellow pubescent hairs. Hemelytra very long, base of cuneus located beyond apex of genital segment; membrane dark

fuscous, veins nearly black. Ventral surface black, strongly shining. Legs black, apical fifth of femora yellow; tibiae yellowish, shaded with black, more yellow at base, hind pair yellow, fuscous on apices. Genital segment and claspers distinctive of the species (Fig. 114).
Female. Length 3.9 mm, width 1.8 mm; costal margin arcuate. Rostrum reaching to base of front coxae. Antennae: segment I, length .30 mm; II, .68 mm, slender, not equal to thickness

of segment I, pubescent hair rather long but sparsely set; III, .58 mm; IV, .34 mm; all segments fuscous to black. Pronotum, length .85 mm, width at base 1.56 mm. Legs with all tibiae yellow, apices fuscous. More robust and hemelytra shorter than in the male, but color and pubescence very similar.

Holotype: ♂ June 24, 1965, Area 19M, Nevada Test Site (H. H. Knight & J. M. Merino). **Allotype:** ♀ same data as the type. **Paratypes:** 11♂ 17♀ taken with the types on *Tetradymia glabrata*, which appears to be the host plant of the species.

Slaterocoris utahensis, new species

Fig. 115

Allied to *longipennis* but size somewhat smaller, and pubescence pallid; distinguished by structure of male claspers (Fig. 115).

Male. Length 4.8 mm, width 1.9 mm; costal margin nearly straight. Head: width 1.02 mm, vertex .51 mm; black. Rostrum, length .74 mm, reaching upon middle coxae. Antennae: segment I, length .30 mm; II, 1.02 mm, cylindrical, thickness not equal to segment I, sparsely clothed with long pubescence; III, .72 mm; IV, .30 mm; black. Pronotum, length .78 mm, width at base 1.42 mm; disk very finely rugulose punctate. Dorsal surface black, rather densely clothed with suberect to erect, long pallid pubescence, not golden yellow as in *longipennis*. Hemelytra rather long, base of cuneus just above tip of genital segment, black, shining; membrane dark fuscous, veins nearly black. Ventral surface black, shining. Legs black, tips of femora pale yellowish; tibiae black, hind pair more nearly fuscous. Genital segment and claspers distinctive of the species (Fig. 115).

Female. Length 3.7 mm, width 1.8 mm; costal margin moderately arcuate. Head: width 1.10 mm, vertex .66 mm. Rostrum, length .92 mm, reaching to middle of intermediate coxae. Antennae: segment I, length .32 mm; II, .78 mm,

more slender than I; III, .62 mm; IV, .34 mm; black. Pronotum, length .78 mm, width at base 1.4 mm. Legs black, tips of femora and the tibiae yellow. More robust than the male, color except tibiae and the pubescence very similar to the male.

Holotype: ♂ June 29, 1965, Scipio, Utah (H. H. Knight). **Allotype:** ♀ taken with the type. **Paratypes:** ♀ July 16, 1964, alt. 7000 ft, Steamboat Springs, Colorado (H. H. Knight). 2♂ June 23, alt. 5425 ft, Bancroft, Idaho (C. Wakefield), swept from wheat.

Slaterocoris sheridani, new species

Fig. 113

Allied to *robustus* (Uhler) in form of claspers, but distinguished by the narrower head, shorter pubescence, and by yellow color of the tibiae and apices of femora (Fig. 113).

Male. Length 3.5 mm, width 1.56 mm. Head: width 1.05 mm, vertex .54 mm, black. Rostrum, length .85 mm, reaching upon base of middle coxae, black. Antennae: segment I, length .30 mm, black; II, .88 mm, subcylindrical, thickness at apex equal to segment I, more slender on base, fuscous brown, perhaps yellowish in paler specimens, clothed with short, fine yellowish pubescence; III, .61 mm, black; IV, .32 mm, black. Pronotum, length .75 mm, width at base 1.32 mm, disk finely rugulose punctate, shining. Dorsal surface black, shining, clothed with rather short, recumbent, and in part suberect, golden yellow pubescent hairs. Hemelytra average in length; membrane dark fuscous to black, veins black. Ventral surface black, strongly shining, venter with golden pubescence. Legs black, apical one-third of femora and the tibiae golden yellow; tibial spines and the tarsi black. Genital segment and claspers distinctive of the species (Fig. 113).

Holotype: ♂ Aug. 3, 1927, Sheridan, Wyoming (H. H. Knight). **Paratype:** ♂ taken with the type. Named for General Phil Sheridan, of Civil War fame, and for whom the city is named.

Tribe ORTHOTYLINI

Key to the Genera

- I. Head with a well-defined, sharp posterior margin, or distinct carina 2
- Head without a well-defined, sharp, posterior margin or carina; head and dorsum thickly clothed with appressed, scalelike hairs, interspersed with more erect, simple hairs; hind femora rather long, thicker on basal half, formed for jumping; small forms, mostly under 3.5 mm *Parthenicus* Reut., p. 129

2. Head black, posterior margin of vertex with a high, transverse ridge or carina, and bearing stout black bristles; black forms but with some red and pallid areas *Hadronema* Uhler, p. 94
 Head not black, vertex without ridge bearing stout bristles 3
3. Hind femora with 3 or 4 longitudinal black lines; rostrum reaching upon venter *Argyrocoris* Van D., p. 117
 Hind femora without longitudinal black lines 4
4. Gena with a single suture extending down from base of jugum to a point near middle of gena 5
 Gena without suture extending from base of jugum to near middle of gena 7
5. Pronotum distinctly punctate on disk; dorsum thickly clothed with semidecumbent pubescence *Lopidella* Knegt., p. 100
 Pronotum not distinctly punctate 6
6. First antennal segment much thicker on basal half, tapering from middle to more slender at apex (♂); in female only slightly thicker on basal half *Dalecapidea*, n. gen., p. 101
 First antennal segment not thicker on basal half *Lopidea* Uhler, p. 98
7. First antennal segment rather thick, black, thickness equal to twice the thickness of fore tibia; thickness of segment II equal to more than half that of segment I; dorsum thickly covered with white, flat, scalelike pubescence *Ceratopidea*, n. gen., p. 100
 First antennal segment not so thick 8
8. Pronotum with a distinct black spot behind each callus, formed by black scalelike hairs which arise from a black spot on the cuticula *Ilacora* Reut., p. 102
 Pronotum without a black spot behind each callus 9
9. Claws deeply cleft, leaving inner half wider *Bifidungulus* Knegt., p. 102
 Claws not deeply cleft 10
10. Dorsum bearing two types of pubescence, simple hairs intermixed with sericeous pubescence 11
 Dorsum bearing simple pubescent hairs only *Orthotylus* Fieb., p. 116
11. Head broad, width of vertex three times as great as dorsal width of an eye; clypeus not visible from above; dorsum clothed with erect bristlelike hairs, intermixed with sericeous pubescence; females usually brachypterous *Labopidea* Uhler, p. 95
 Head not so broad, width of vertex little more than two times as great as dorsal width of an eye 12
12. Rostrum reaching beyond posterior coxae to near middle of abdomen; clypeus prominent, protruding far forward *Macrotylodes* Van D., p. 98
 Rostrum shorter, clypeus not protruding far forward 13
13. Dorsal surface bearing two types of pubescence, and intermixed with a few or many, erect bristlelike hairs 14

- Dorsal surface bearing two types of pubescence, simple pubescence intermixed with sericeous hairs, but without bristle-like hairs
..... *Dichaetocoris*, n. gen., p. 110
14. Length of first antennal segment greater than width of vertex plus dorsal width of an eye 15
Length of first antennal segment not equal to width of vertex plus dorsal width of an eye 16
15. Dorsal surface with a few erect, black bristle-like hairs, more prominent on vertex and anterior margin of pronotum; large green species
..... *Ilnacorella* Kngt., p. 102
Dorsal surface without erect, bristle-like hairs; hemelytra pallid, subtranslucent; clothed chiefly with appressed, flat scale-like hairs
..... *Squamocoris*, n. gen., p. 108
16. Femora and tibiae with numerous large and small black spots; male genital segment with a single tergal process *Pseudopsallus* Van D., p. 103
Femora without large and numerous small black spots 17
17. Dorsal surface sparsely set with short bristle-like hairs, or bristles absent 18
Dorsal surface rather densely clothed with bristle-like pubescence; male genital segment with two or three tergal processes *Hesperocapsus*, n. gen., p. 103
18. Pronotum and corium thickly clothed with prostrate or appressed black and white, sericeous pubescence, with very few bristles; venter very dark; third antennal segment equal to three times the length of segment IV
..... *Noctuocoris* Kngt., p. 109
Pronotum and corium bearing numerous erect short bristles; venter light colored; third antennal segment not equal to three times the length of segment IV; mostly small green species, length under 5.0 mm
..... *Melanotrichus* Reut., p. 117

Genus *Hadronema* Uhler

Hadronema picta Uhler

Hadronema picta Uhler, 1895:31.

Hadronema picta Knight, 1928:180, key.

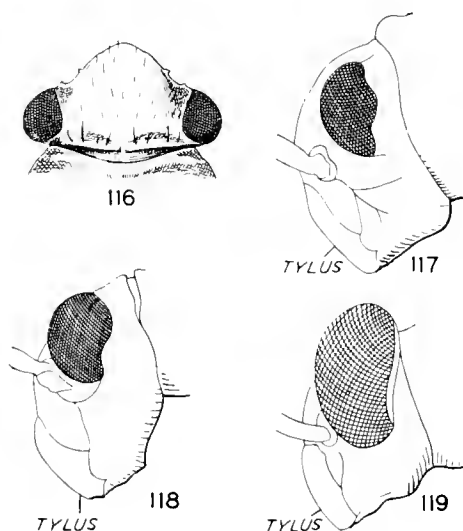
Records for the test site: Area 16M, ♂ ♀ June 11, ♀ Aug. 19, 1965; Area 19M, 10♂ 5♀ June 22, 1965, taken on *Viguiera multiflora*; Area 401M, 4♂ 6♀ June 18, 1965, collected on *Viguiera multiflora*; Area TE, 4♂ 4♀ June 10, 1965.

This species was described from Colorado, and is now known from Nevada, Arizona, New Mexico, and western Kansas.

Hadronema uhleri Van Duzee

Hadronema uhleri Van Duzee, 1928:182.

Hadronema (Aoplonema) uhleri Knight, 1928: 182, key.



Figs. 116-119. Head. 116, *Hadronema militare*; 117, *Lopidea confluenta*; 118, *Ilnacora stalii*; 119, *Mecomma gilvipes*.

Records for the test site: Area 6M, ♂ 2 ♀ June 15, 1965; Area 16M, ♂ June 11, ♀ June 24, 1965; Area 17M, ♀ June 12, 1965; Area TM, ♀ June 14, 1965.

This species is also known from California, Arizona, Utah, Colorado, Idaho, and Washington.

Hadronema uniformis Knight

Hadronema uniformis Knight, 1928:180.

Differs from *princeps* Uhler and *uhleri* Van D. with larger head, more tumid frons, and by the uniformly black corium and cuneus.

Known from Idaho and Oregon, and now an

additional record from Nevada: 12♂ July 8, 1966, Goldfield, Esmeralda County (C. W. O'Brien). This species should occur at the test site.

Hadronema sinuata Knight

Hadronema sinuata Knight, 1928:179.

Distinguished from allied species by the sinuate lateral margins of pronotum, and by a deep transverse groove across vertex along front edge of carina.

Known from Arizona and Utah; also taken in Utero County, New Mexico, where it was found on "salt bush."

Genus *Labopidea* Uhler

Key to the Species

- 1. Legs black 2
- Legs not black 3
- 2. Hemelytra with black bristly hairs; length 3.1-4.6 mm *nigri-setosa* Kngt.
- Hemelytra with pale hairs, without black setae; length 3.7-4.1 mm *nigripes* Reut.
- 3. Length of antennal segment II exceeding width of pronotum 6
- Length of antennal segment II not exceeding width of pronotum 4
- 4. Length of antennal segment II not equal to width of pronotum 5
- Length of antennal segment II subequal to width of pronotum; head pallid, antennal segment I pallid, but with four or five black bristles on dorsal surface; length 4.8 mm *atriseta* Van D.
- 5. Antennal segment II short, subequal to width of head; length 4.2 mm *chloriza* Uhler
- Antennal segment II almost equal to width of pronotum at base; length 4.6-5.1 mm *arizonae* Kngt.
- 6. Hemelytra green, pale pubescent or vertex with basal carina 7
- Hemelytra subtranslucent, pale fuscous; scutellum pallid; length 4.4 mm (♂) *arizonae* Kngt.
- 7. Antennal segment I green 8
- Antennal segment I black, segment II brownish black; length 4.9 mm *simplex* Uhler
- 8. Rostrum not reaching to posterior margin of mesosternum 9
- Rostrum reaching to posterior margin of mesosternum; length 5.1 mm *viridula* Kngt.

9. Vertex with prominent basal carina 10

Vertex without a basal carina; hemelytra subtranslucent, pallid to blue green, membrane clear, veins and areoles blue green; length 4.4 mm

..... *utahensis*, n. sp.

10. Length of antennal segment II subequal to width of head plus width of vertex; male genital claspers distinctive (Fig. 120); length 4.1 mm

..... *idahoensis*, n. sp.

Length of antennal segment II not equal to width of head plus width of vertex; male claspers distinctive (Fig. 123); length 3.9 mm. *allii* Kngt.

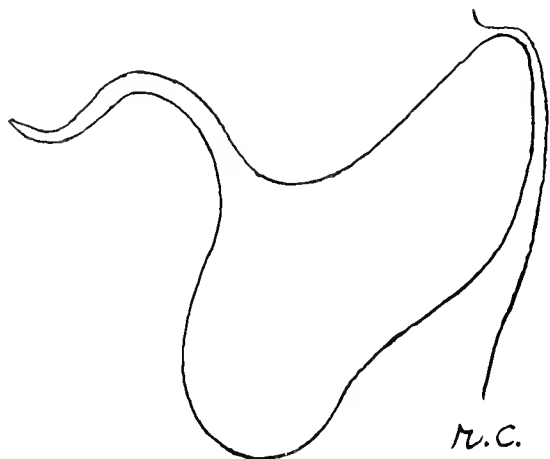


Fig. 120. *Labopidea idahoensis*, ♂ right clasper.

Labopidea nigrisetosa Knight

Labopidea nigrisetosa Knight, 1925:94.

Known from British Columbia, Washington, Oregon, Idaho, and Wyoming.

Labopidea nigripes (Reuter)

Orthotylus nigripes Reuter, 1909:68.

Known from Colorado, Nevada, California, Oregon, and British Columbia.

Labopidea atriseta Van Duzee

Labopidea atriseta Van Duzee, 1916:221.

Known from San Diego County, California, and Oregon.

Labopidea chloriza Uhler

Labopidea chloriza Uhler, 1877:416.

Labopidea chloriza Van Duzee, 1917:400, cat.

Known from Colorado, New Mexico, and Utah.

Labopidea arizonae Knight

Labopidea arizonae Knight, 1928:233.

Known from Arizona and California.

Labopidea simplex (Uhler)

Tinicephalus simplex Uhler, 1872:417.

Labopidea simplex Van Duzee, 1916:220, key.

Known from Arizona, Utah, Colorado, Wyoming, Montana, and New Mexico.

Labopidea viridula Knight

Labopidea viridula Knight, 1928:234.

Known from Utah and Montana.

Labopidea alli Knight

Figs. 121, 123

Labopidea alli Knight, 1923:31.

Known from Illinois, Iowa, Kansas, Missouri, Arkansas, and Oklahoma. Breeds on wild onion and garlic, *Allium*, and sometimes on cultivated onions.

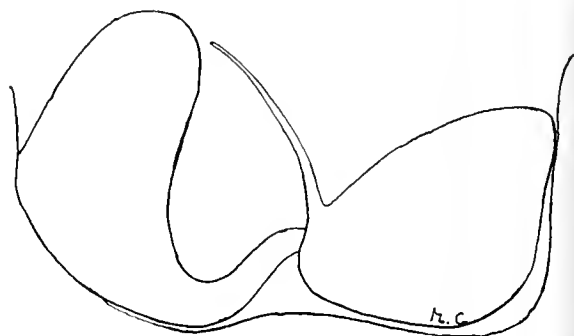


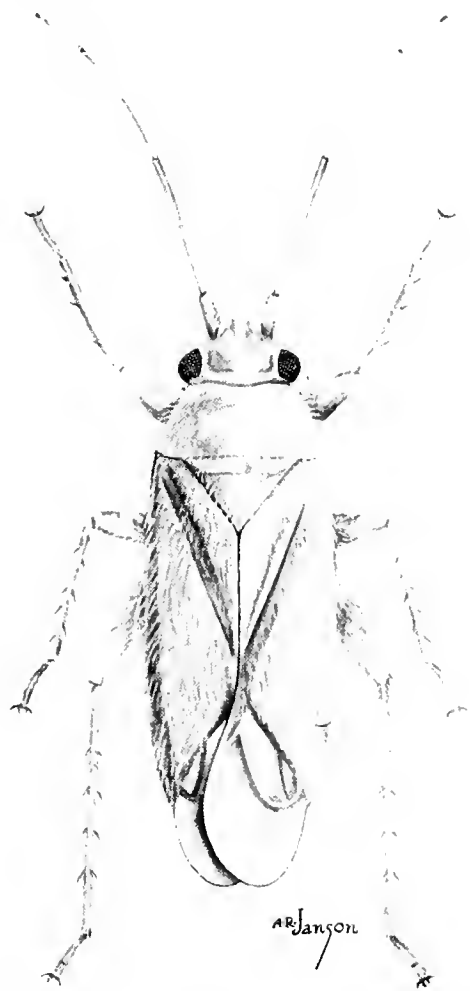
Fig. 121. *Labopidea alli* Kngt., ♂ claspers.

Labopidea idahoensis, new species

Fig. 120

Runs in the key to the couplet with *allii* Kngt., from which it may be separated by longer antennal segments; male genital claspers distinctive (Fig. 120).

Male. Length 4.1 mm, width 1.3 mm; costal margins only slightly arcuate. Head: width .85 mm, vertex .50 mm; vertex nearly flat, with distinct basal carina. Rostrum, length .72 mm, just reaching to middle of mesosternum, pallid, apex blackish. Antennae: segment I, length .47 mm, thickness .12 mm, slightly thicker near base, pale greenish, clothed with suberect fuscous hairs; II, 1.36 mm, cylindrical, thickness little more than half that of segment I, yellowish green, clothed with recumbent, yellowish to dusky pubescence; III, 1.22 mm, yellowish to pale fuscous; IV, missing. Pronotum, length .48 mm, width at base .98 mm; disk flat, basal margin slightly sulcate each side of middle; yellow-

Fig. 122. *Labopidea allii* Kngt., long-winged form.Fig. 123. *Labopidea allii* Kngt., short-winged form.

ish to green, lateral margins slightly sulcate; calli slightly tumid, impressed between and along basal margin. Dorsal surface clothed with suberect pale yellowish hairs, intermixed with more erect brown to fuscous bristles, also sparsely covered with more appressed, silvery sericeous pubescence. Scutellum slightly convex, mesonotum moderately exposed, pale yellowish to greenish. Hemelytra subtranslucent, pale to greenish. Membrane pale to dusky translucent, veins dusky, no green evident. Ventral surface pale to greenish yellow, legs pallid to greenish, femora more greenish. Male genital segment and claspers distinctive (Fig. 120); note the right clasper.

Holotype: ♂ May 5, 1937, alt. 2700 ft, Genessee, Idaho (V. E. Nygren).

Labopidea utahensis, new species

Runs in the key near *allii* Kngt. due to the short rostrum, but differs from it and *idahoensis* by absence of a basal carina.

Female. Length 4.4 mm, width 1.3 mm. Head: width .78 mm, vertex .41 mm; vertex flat, carina absent, only weakly indicated near

eyes. Rostrum, length .78 mm, just reaching upon middle of mesosternum, pallid. Antennae: segment I, length .51 mm, thickness .14 mm, green; II, 1.39 mm, cylindrical, thickness just half that of segment I, pale to dusky; III, 1.42 mm, dusky to fuscous; IV, .61 mm, pale fuscous. Pronotum, length on median line to an imaginary line drawn between basal angles, .50 mm, width at base 1.02 mm; disk flat, a transverse impressed line across basal margins of calli, pallid to bluish green. Mesoscutum broadly exposed, pallid. Scutellum rather flat, pallid to

greenish. Hemelytra with costal margins nearly parallel, subtranslucent, pallid to blue green; clavus, embolium and cuneus deeper blue green. Membrane dusky translucent, areoles and veins blue green. Dorsal surface clothed with suberect pallid, simple pubescent hairs, finely intermixed with more recumbent, fine sericeous hairs. Ventral surface pallid to greenish. Legs pallid to greenish.

Holotype: ♀, American Fork, Utah (A. B. Call, Jr.).

Genus *Macrotyloides* Van Duzee

Key to the Species

1. Dorsal surface with erect fuscous hairs intermixed with simple and sericeous pubescence; membrane uniformly pale fuscous *vestitus* (Uhler)
- Dorsal surface with silvery sericeous pubescence but without fuscous hairs; membrane with apex dark fuscous *apicalis* Van D.

Macrotyloides vestitus (Uhler)

Macrotylus vestitus Uhler, 1890:88.

Macrotyloides vestitus Van Duzee, 1916:222.

Known from San Diego County, California, Colorado, and Idaho.

Macrotyloides apicalis Van Duzee

Macrotyloides apicalis Van Duzee, 1916:223.

Described from San Diego County, California; now I have a specimen from Tucson, Arizona (E. D. Ball).

Genus *Lopidea* Uhler

Lopidea becki, new species

Fig. 125

Related to *ute* Kugt. in form of right genital clasper, but broader on basal half; easily distinguished when figures of the claspers are compared (Fig. 125).

Male. Length 5.1 mm, width 1.6 mm. Head: width 1.05 mm, vertex .57 mm. Rostrum, length 1.7 mm, black, reaching upon posterior coxae. Antennae: broken, see female. Pronotum, length .85 mm, width at base 1.42 mm; reddish, anterior margin and median stripe of disk, pallid; calli reddish, dotted with fuscous. Scutellum pallid, basal angles reddish. Hemelytra reddish, shaded with fuscous; embolium and cuneus pallid or white; membrane and veins fuscous. Dorsal sur-

face clothed with very short, sparsely set, pale to yellowish, appressed pubescent hairs; almost glabrous. Ventral surface pallid and with reddish, mesosternum fuscous. Legs pale to fuscous, with serial dots of fuscous on femora. Venter pallid, with red on lateral area. Male claspers distinctive of the species (Fig. 125).

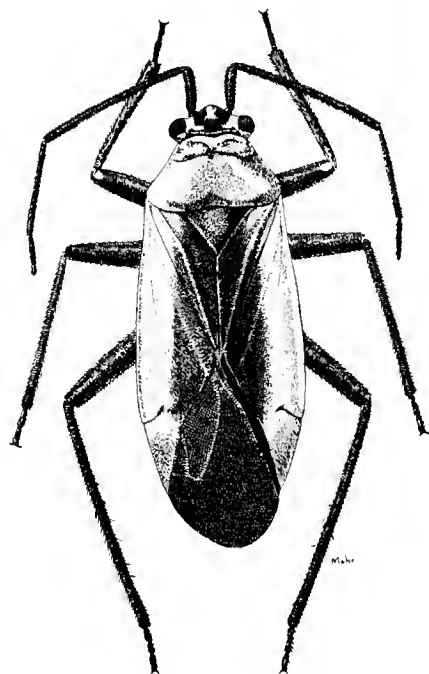


Fig. 124. *Lopidea confluenta* (Say), ♀.

Female. Length 5.2 mm, width 1.6 mm. Head: width 1.10 mm, vertex .64 mm. Antennae: segment I, length .44 mm; II, 1.53 mm, slender; III, .74 mm; IV, .40 mm. Pronotum, length .92 mm, width at base 1.49 mm. Pubescence and coloration very similar to the male.

Holotype: ♂ June 14, 1965, Area TM, Nevada Test Site (D E. Beck, H. H. Knight & J. M. Merino), taken on *Eriogonum umbellatum*. **Allotype:** ♀ same data as the type. **Paratypes:** 2 ♀ taken with the types. ♀ June 13, 1964, Nevada Test Site, taken on *Eriogonum fasciculatum*.

Lopidea knowltoni Knight

Lopidea knowltoni Knight, 1965:6, Fig. 6.

Records for the Nevada Test Site are: Area 17M, ♂ June 12, 1965; Area 18M, ♂ June 20, ♂ June 23, 1965, taken on *Chrysothamnus nauseosus*; Area 19M, 5 ♂ 9 ♀ June 24, 1965, taken on *Chaenactis steviodes*; Area 401M, ♀ June 18, 1965, taken on *Chrysothamnus nauseosus*.

This species was only recently described from a single male taken near Lovelock, Nevada. Most specimens have been taken on *Chrysothamnus*, but the largest single collection was made on *Chaenactis steviodes*.

Lopidea scutata Knight

Lopidea scutata Knight, 1962:34, Fig. 7.

Records from the test site are: Area 16M, ♂ June 24, 1965; Area 17M, ♀ June 17, 1965; Area 18M, 5 ♂ 4 ♀ June 23, 1965, taken on *Pinus monophylla*; Area 19M, 3 ♂ June 22, 8 ♂ 5 ♀ June 23, 1965, on *Ephedra nevadensis*; Area 401M, 2 ♂ 4 ♀ June 19, ♂ June 22, 1965, on *Pinus monophylla*; Area TM, ♂ June 14, 1965.

This species was originally described from specimens collected in Arizona. An additional collection made in Utah is a ♂ June 29, 1965, Scipio (H. H. Knight).

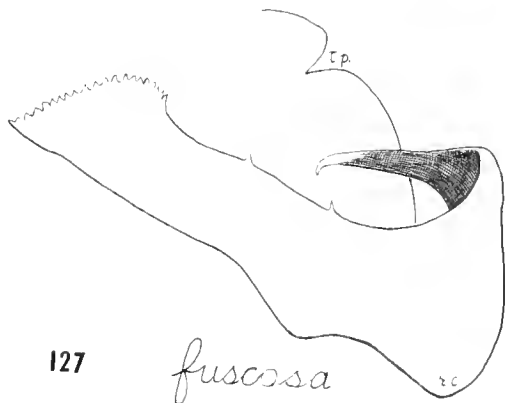
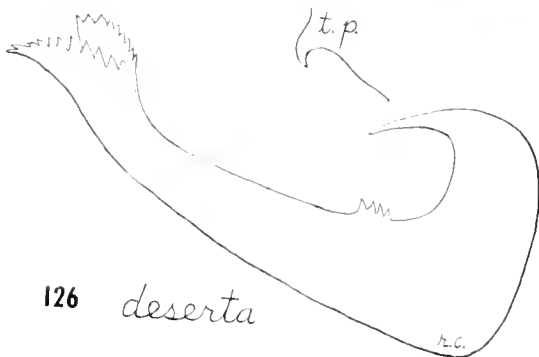
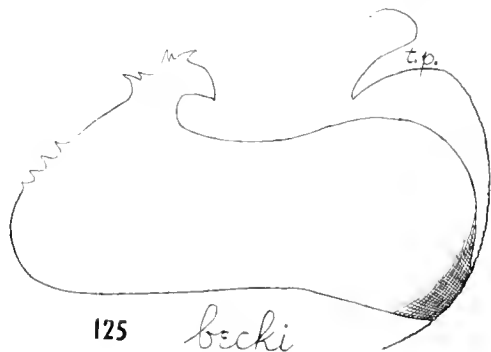
Lopidea deserta, new species

Fig. 126

Related to *bullata* Kngt., but second antennal segment subequal to or greater than width of head across eyes; also the male genital segment and claspers differ in some details (Fig. 126).

Male. Length 4.6 mm, width 1.8 mm. Head: width 1.3 mm, vertex .78 mm; white, base and each side of clypeus, transverse lines forming patch each side of frons, and spot each side of vertex, black. Rostrum, length 1.5 mm, reaching to middle of hind coxae. Antennae: segment I,

length .40 mm, fuscous, black on base; II, 1.42 mm, black; III, .95 mm, black; IV, .37 mm. Pronotum, length .88 mm, width at base 1.56 mm, sinuate on base; white, calli black, basal half of disk infuscated. Scutellum, fuscous, pale on middle. Hemelytra white, with fuscous, clavus fuscous each side of claval vein; corium chiefly fuscous, embolium and cuneus white; membrane pale fuscous, veins darker. Dorsal surface clothed with minute pale pubescence, almost glabrous in aspect. Ventral surface white, mesosternum black, sides paler. Legs pallid to white, femora with fuscous spots, tibiae dusky, tarsi black. Venter pallid, a lateral line formed by



Figs. 125-127. ♂ right clasper. 125 *Lopidea becki*; 126, *L. deserta*; 127, *L. fuscosa*.

spots. Genital segment and claspers distinctive of the species (Fig. 126).

Female. Length 4.1 mm, width 1.8 mm; costal margin arcuate, membrane abbreviated. Head: width 1.36 mm, vertex .85 mm. Antennae: segment I, length .37 mm; II, 1.39 mm, subequal to width of head; III, .74 mm; IV, .37 mm. Pronotum, length .78 mm, width at base 1.49 mm. More robust than the male, color and pubescence very similar to the male.

Holotype: ♂ June 13, 1965, Area SC, Nevada Test Site (D E. Beck, H. H. Knight & J. M. Merino). **Allotype:** ♀ same data as the type. **Paratypes:** All from the Nevada Test Site: Area 6M, 56♂ 42♀ June 15, 6♂ 3♀ June 17, 1965; Area 16M, 2♂ 1♀ June 11, 1965, on *Tetradymia*; Area 17M, ♀ June 16, 1965; Area 18M, ♂ ♀ June 20, 1965, on *Chrysothamnus nauseosus*; Area CM, 12♂ 1♀ June 13, 1965; Area TM, 5♂ 3♀ June 14, 1965.

From the collecting data it appears likely that this species may have two or more different host plants.

Lopidea fuscata, new species

Fig. 127

Allied to *paddocki* by general form of the claspers, but differs in details as shown in the figures (Fig. 127).

Male. Length 4.7 mm, width 1.7 mm. Head: width 1.15 mm, vertex .67 mm; fuscous to black, juga, a wide band around eye, and a spot above each side of vertex, pallid, the median line on frons brownish. Rostrum, length 1.49 mm, reaching upon apex of hind coxae, black. Antennae: segment I, length .34 mm, fuscous to black; II, 1.22 mm, cylindrical, slender, about equal to two-thirds the thickness of segment I, black; III, .85 mm, slender, black; IV, .41 mm, black. Pronotum, length .92 mm, width at base 1.56 mm; disk pallid to fuscous and black, calli with dots and margins black, pallid before calli. Hemelytra and scutellum fuscous, embolium and cuneus white; membrane and veins fuscous. Dorsal surface bearing short, suberect stiff black hairs; sparsely intermixed on hemelytra with fine, short, appressed sericeous pubescence. Ventral surface fuscous, mesosternum nearly black. Legs fuscous, femora with two rows of black dots showing through the fuscous color. Genital segment and claspers distinctive of the species (Fig. 127); related to *paddocki* but details differ as shown in the figures.

Female. Length 3.5 mm, width 2.0 mm; brachypterous, membrane short, not reaching

apex of abdomen. Head: width 1.19 mm, vertex .68 mm. Rostrum just reaching apex of hind coxae. Antennae: segment I, length .37 mm; II, 1.53 mm; III, .92 mm; IV, .47 mm. Pronotum, length .74 mm, width at base 1.49 mm. More robust than the male but very similar in color and pubescence.

Holotype: ♂ June 23, Area 19M, Nevada Test Site (H. H. Knight & J. M. Merino), taken while sweeping *Artemisia tridentata*. **Allotype:** same data as type. **Paratype:** ♂ June 15, 1965, Area 6M, Nevada Test Site.

In Colorado, *Lopidea nigricea* Uhler is a common species on *Artemisia tridentata*, but it was not found on this plant at the test site.

Genus *Lopidella* Knight

Lopidella flavoscuta Knight

Lopidella flavoscuta Knight, 1925:41.

Known from the vicinity of Tucson, Globe, Superior, Empire Mts., Rincon Mts., and Santa Rita Mts. in Arizona.

Ceratopidea, new genus

Runs in the key to *Orthotylini*: arolia erect and converging at the apices. Related to *Daleapidea* and *Lopidea* but without a suture across gena. Antennae with first and second segments much thicker than in related genera; thickness of segment I equal to twice the thickness of fore tibia. Dorsal surface thickly covered with white, flat, scalelike pubescence, intermixed with suberect, simple pubescent hairs; but without erect bristles. Type of the genus: *Ceratopidea daleae*, new species.

Ceratopidea daleae, new species

No close relative of this species can be named, but the genus and species are distinguished in the keys. The species is distinguished by the thick antennal segments and by the abundance of white scalelike pubescence that covers the body.

Male. Length 4.0 mm, width 1.5 mm. Head: width .95 mm, vertex .46 mm; pallid to white, vertex and frons with white scalelike pubescence. Rostrum, length 1.19 mm, reaching between apices of middle coxae, pallid, apical half black. Antennae: segment I, length .32 mm, width .15 mm, black, with three black bristles and short black pubescent hairs; II, 1.22 mm, cylindrical, thickness .11 mm, black, covered with short, recumbent golden to copper colored

pubescence; III, .92 mm, slender, black; IV, .37 mm, fuscous. Pronotum, length .78 mm, width at base 1.39 mm, basal margin straight across mesonotum, curving to form basal angles, lateral margins slightly sulcate, turning down sharply to form the propleura; pallid to white, calli black, clothed like the scutellum and hemelytra, with appressed, flat to sericeous scalelike pubescence, and intermixed with sparsely set, simple, suberect, white hairs. Mesosternum and scutellum black, moderately convex. Hemelytra pallid to white, sometimes with pale fuscous shading; cuneus fuscous, mostly covered with white, sericeous pubescence. Membrane opaque white, veins green. Beneath white, sides of thorax and the venter thickly covered with white scalelike hairs; middle area of mesonotum black, sides white and covered with white scales. Legs white, apical half of femora with broad black band, leaving apices white to green; tibiae with base and apices black, tibial spines white but with black spot at base of each; tarsi fuscous to black. Venter white, hypodermal green shows through; a lateral line of glabrous black spots on each side, and basal margin of genital segment black. Male claspers distinctive of the species.

Female. Length 4.2 mm, width 1.7 mm. Head: width .95 mm, vertex .51 mm. Rostrum, length 1.4 mm, reaching to middle of hind coxae. Antennae: segment I, length .37 mm, width .17 mm, black; II, 1.22 mm, thickness .12 mm, cylindrical, black; III, .88 mm, black; IV, .34 mm, black. Pronotum, length .82 mm, width at base 1.5 mm. More robust than the male but very similar in color and pubescence.

Holotype: ♂ June 18, 1965, Area 401M, Nevada Test Site (H. H. Knight & J. M. Merino). **Allotype:** ♀ taken with the type. **Paratypes:** 31 ♂ 30 ♀ June 18, 1965, Area 401M, Nevada Test Site, taken with the types on *Dalea polyadenia*, host plant of the species. ♂ 3 ♀ June 17, 1966, Pyramid Lake, Washoe County, Nevada (W. Gagne).

Daleapidea, new genus

Arolia well developed, erect and converging at the apices which places this genus in subfamily Orthotylinae; other characters place it in tribe Orthotylini. Gena with a single suture extending down from base of jugum to a point near middle of gena, which relates this genus to *Lopidea* and *Lopidella*. Distinguished by the first antennal segment which in the male is very thick on basal half but tapered to more slender

on apex; posterior femora distinctly curved in the male; genital segment narrowed apically to a rather slender apex. Type of the genus: *Daleapidea daleae*, new species.

Daleapidea daleae, new species

Fig. 128

Distinguished by the pallid to white color, with setigerous black dots on hemelytra; legs black, hind femora curved in the male, genital segment narrowed to slender conical apex.

Male. Length 4.5 mm, width 1.36 mm. Head: width .98 mm, vertex .53 mm; nearly vertical in position, clypeus not visible when viewed from above, black, polished, a pale spot bordering each eye above, juga, lora, genae and bucculae, white. Rostrum, length 1.26 mm, reaching to apex of middle coxae, black. Antennae: segment I, length .62 mm, thicker (.22 mm) on basal half, tapering to more slender at apex (.12 mm), black, shining, finely pubescent; II, 1.98 mm, slender (.08 mm) on basal half, to incrassate (.17 mm, thick) on apical half, black, finely pale pubescent; III, 1.36 mm, thickness .07 mm, black; IV, .44 mm, black. Pronotum, length .88 mm, width at base 1.36 mm; basal margin broadly arcuate, lateral margins distinct, slightly sulcate, collar narrowed above, white;

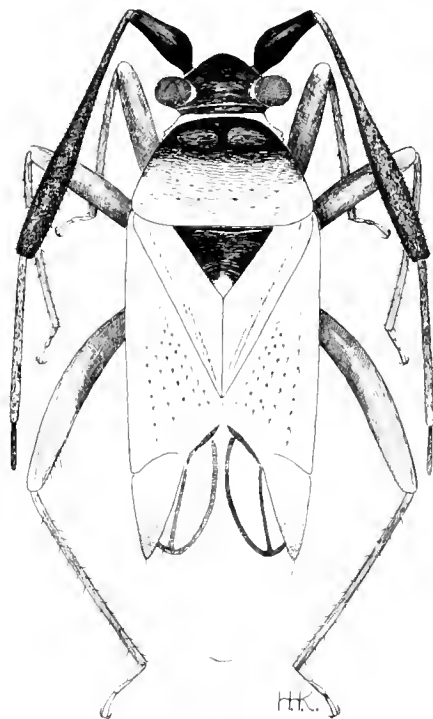


Fig. 128. *Daleapidea daleae*, ♂.

disk moderately convex, transversely rugulose, whitish to fuscous, calli black, disk bearing short, suberect yellowish hairs. Mesonotum narrowly exposed, black; scutellum moderately convex, disk transversely rugulose, fuscous to black. Hemelytra pallid to white, sparsely dotted with setigerous fuscous spots, a moderately long, suberect, golden setose hair arises from each fuscous dot; cuneus pallid, with a few dots; membrane translucent to opaque white, veins black. Sides of thorax white, ostiolar peritreme indistinct, much reduced; mesosternum black. Legs black, front coxae white on anterior aspect; hind femora somewhat flattened and curved, bearing long pale hairs on ventral aspect of the curved part; front tibiae with distinct bristle brush on ventral aspect of apical fourth; posterior femora and tibiae rather slender. Venter black, rather narrow, sparsely pubescent; genital segment rather slender, conical in shape, twisted to the left side; claspers rather small and inconspicuous.

Female. Length 4.4 mm, width 1.7 mm. Head: width .96 mm, vertex .51 mm. Antennae: segment I, length .41 mm, width .136 mm, slightly thicker on basal half, but more slender than in the male, black; II, 1.22 mm, slender on basal half, tapering thicker (.11 mm thick) on apical half, black; III, 1.02 mm, slender, black; IV, .41 mm, black. Pronotum, length .95 mm, width at base 1.56 mm; more robust and more broadly white than in the male; ventral surface broadly pallid to white; pubescence and the setigerous fuscous dots on hemelytra very similar.

Holotype: ♂ June 13, 1965, Area CM, Nevada Test Site (D E. Beck, H. H. Knight & J. M. Merino). **Allotype:** ♀ same data as the type. **Paratypes:** 3♂ 10♀ taken with the types. 2♂ 1♀ June 10, 1965, Area CM, Nevada Test Site (D E. Beck, H. H. Knight & J. M. Merino), collected on *Dalea polyadenia*, host plant of the species. 4♂ 4♀ April 17, 1937, 4 miles east of Edom, California (Timberlake), collected on *Dalea schottii*; these specimens have more white than black, but no structural difference could be found.

Dalcapidea albescens (Van Duzee)

Hadronema albescens Van Duzee, 1918:297.

I have identified the following specimens collected at the test site: Area CM, ♂ June 13, 1965; Area 5M, 2♀ June 14, 1961, at black light.

Other records: Van Duzee (1918) described this species from a large series of specimens

taken on *Dalea cmoryi* at Palm Springs, California, May 18-22, 1917; ♀ June 28, 1919, Independence, California (L. L. Muchmore). I have seen other specimens labeled "San Diego Co." 4♂ 7♀ Dec. 20, 1939, Yuma County, Arizona (L. L. Stitt), "breeds on *Dalea*."

Genus *Ilnacorella* Knight

Ilnacorella argentata Knight

Ilnacorella argentata Knight, 1925:94.

This species is known from Utah, Idaho, Montana, and Oregon.

Ilnacorella sulcata Knight

Ilnacorella sulcata Knight, 1925:93.

Known from Colorado, Idaho, Wyoming, and Alberta.

Ilnacorella nigrisquamosa Knight

Ilnacorella nigrisquamosa Knight, 1925:92, Fig. 1.

This species is known from Colorado and Wyoming.

Genus *Ilnacora* Reuter

Ilnacora arizonae Knight

Ilnacora arizonae Knight, 1963:171, Fig. 4.

This species is known from the vicinity of Tucson, Arizona.

Ilnacora santacatalinae Knight

Ilnacora santacatalinae Knight 1963:172.

Known from the Santa Catalina Mts., Arizona.

Ilnacora nicholi Knight

Ilnacora nicholi Knight, 1963:169, Fig. 2.

This species is known from Tucson and the Santa Rita Mts., Arizona.

Ilnacora albifrons Knight

Ilnacora albifrons Knight, 1963:165, Fig. 12.

Known from Colorado, Oregon, and Washington.

Genus *Bifidungulus* Knight

Bifidungulus puberus (Uhler)

Oncotylus puberus Uhler, 1894:270.

Bifidungulus puberus Knight, 1930:2.

I have identified the following specimens taken at the test site: Area 17M, 8♂ 15♀ June

12, 12♂ 13♀ June 16, 6♂ 5♀ June 17, 1965; Area 18M, ♂ June 11, 1965; Area 19M, ♂ June 24, 1965. Nearly all the specimens were swept from *Oenothera californica* where the bugs frequented the flowers and were covered with pollen. Nymphs and teneral adults were taken on the flowers, so I believe that *Oenothera* must be a favored host plant for this mirid bug.

This species was originally described from southern California, and later Knight (1930) recognized it from Arizona.

Genus *Pseudopsallus* Van Duzee

Pseudopsallus angularis (Uhler)

Macrotylus angularis Uhler, 1894:272.

Pseudopsallus angularis Van Duzee, 1916:224.

Originally described from Lower California, it has since been found at several localities in San Diego County, California (H. Morrison). New records: ♂ June 13, 1931, Los Angeles County, California (H. A. Scullen). 9♂ 9♀ June 1, 1941, Pinal Mt., Arizona (L. L. Stitt). ♂ ♀ July 1, 1961, Mt. Springs Summit, alt. 5400 ft, Clark County, Nevada (F. D. Parker).

Hesperocapsus, new genus

Distinguished in the key to genera of *Orthotylini*; all species are green in color, clothed with two types of pubescence, with appressed, silvery scalelike pubescence, and thickly intermixed with erect bristlelike hairs. Genital segment distinctive, the posterior margin of the tergite forms anterior margin of genital cavity, and bears from two to four projecting chitinous plates and spines (tergal processes) which in form are distinctive of the species (Figs. 129-139). Type of the genus: *Pseudopsallus artemisicola* Knight.

Hesperocapsus artemisicola (Knight)

Fig. 129

Pseudopsallus artemisicola Knight, 1930:2.

This species was described from eastern Colorado where it bred abundantly on *Artemisia filifolia*. I have identified specimens of this species from Wichita County, Kansas (F. X. Williams). Structures of the male genital segment are shown in Figure 129.

Hesperocapsus tanneri (Knight)

Fig. 134

Pseudopsallus tanneri Knight, 1930:5.

This species was described from a specimen taken at Mesa Verde National Park, Colorado,

and named for Vasco M. Tanner, the collector of the type specimen. The species is also known from Kanab and La Sal, Utah; and Butte, Montana. The allotype specimen was collected beyond Jacumba, San Diego County, California (H. Morrison). With this distribution *tanneri* should occur at the Nevada Test Site. Structures of the male genital segment are distinctive, with four tergal processes taking on remarkable form (Fig. 134).

Hesperocapsus davis (Knight)

Fig. 130

Pseudopsallus davis Knight, 1930:6.

Records for the Nevada Test Site: Area 17M, 5♂ 6♀ June 11, ♂ June 12, 1965; Area 19M, 3♂ June 22, 3♂ 2♀ June 23, 1965, collected on *Artemisia tridentata*.

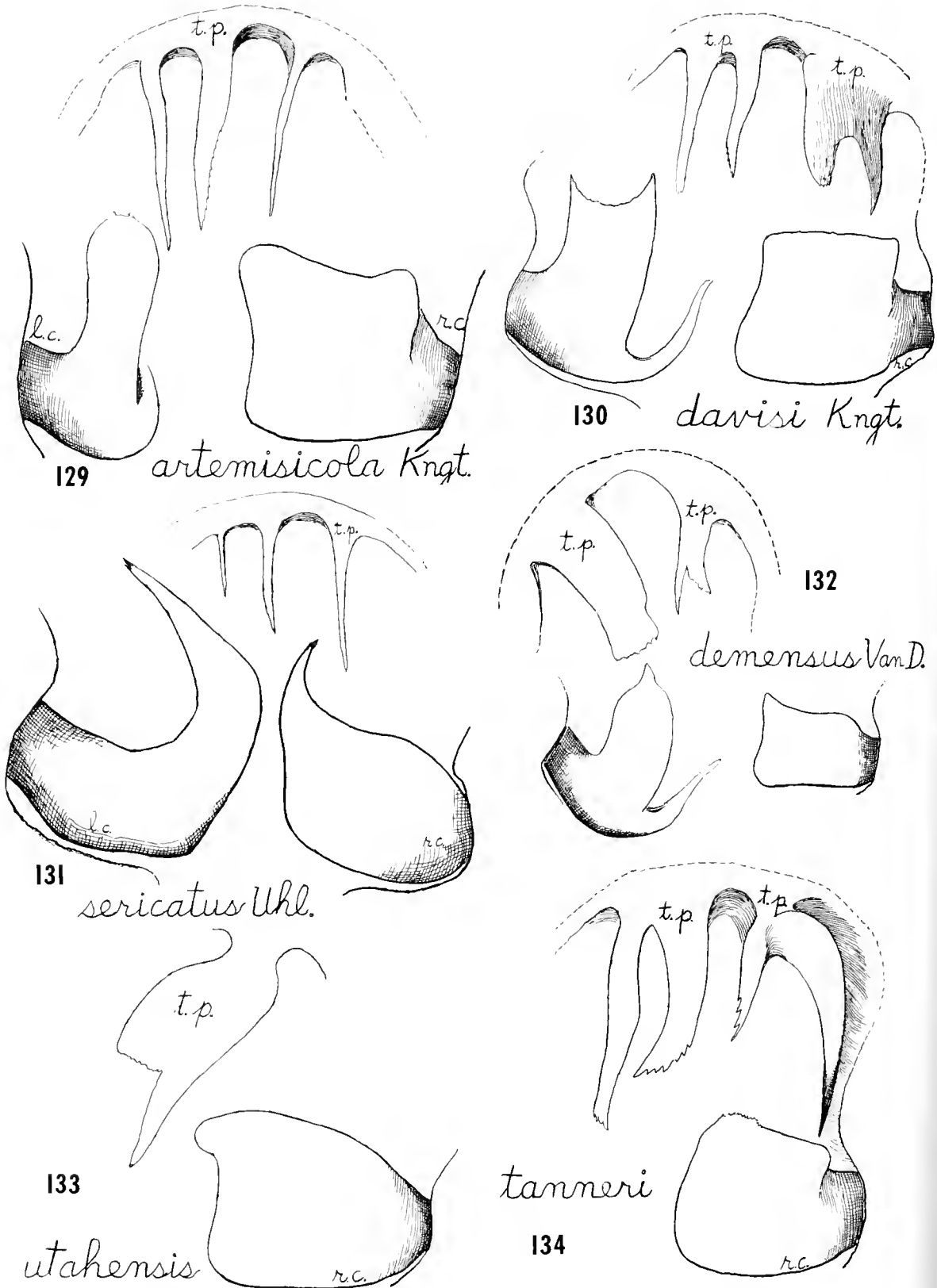
This species was described from a single male collected July 15, 1929, at Richfield, Utah (E. W. Davis), taken at a light trap. It was named for Mr. Davis who was an entomologist at the U. S. D. A. Laboratory at that time. The Nevada records given above are the first specimens I have seen since the original description.

Hesperocapsus plagiatus, new species

Fig. 135

Distinguished from other species by the two longitudinal fuscous stripes which cover corium and basal half of clavus; rostrum reaching apices of hind coxae; genital segment distinctive, provided with one small and one rather long tergal process (Fig. 135).

Male. Length 6.3 mm, width 2.0 mm. Head: width 1.03 mm, vertex .41 mm; pallid, frons and spot each side of vertex, fuscous. Rostrum, length 1.83 mm, reaching upon apex of posterior coxae, pallid, apical half brownish black. Antennae: segment I, length .37 mm, pale fuscous; II, 1.55 mm, cylindrical, thickness nearly equal to that of segment I, fuscous, thickly clothed with suberect fuscous pubescence; III, 1.26 mm, dark fuscous; IV, .37 mm, fuscous. Pronotum, length .82 mm, width at base 1.56 mm, lateral margins slightly sulcate, sharply defined but not carinate; disk moderately convex, pallid to pale fuscous, calli darker fuscous; disk and head clothed with moderately thick, silvery sericeous hairs, sparsely intermixed with bristle hairs. Mesonotum and scutellum pallid to pale fuscous. Hemelytra and dorsal surface rather sparsely clothed with appressed, silvery sericeous pubescence, and intermixed with suberect pallid to dusky bristlelike hairs; pallid and



Figs. 129-134. Male claspers. 129, *Hesperocapsus artemisicola* Kngt.; 130, *H. davisi* Kngt.; 131, *H. sericatus* (Uhl.); 132, *H. demensus* (Van D.); 133, *H. utahensis*; 134, *H. tanneri* (Kngt.).

subtranslucent, corium inside the radial vein, and basal half of clavus, fuscous, cuneus clear; membrane rather uniformly light fuscous, veins pallid; embolar margins nearly straight, subparallel. Ventral surface pallid to greenish, mesosternum fuscous; venter with an impressed lateral line, marked with fuscous spots. Genital segment distinctive, with one small and one longer tergal process; claspers distinctive (Fig. 135).

Female. Length 5.3 mm, width 2.0 mm. Head: width .90 mm, vertex .44 mm. Rostrum, length 1.8 mm, reaching slightly beyond hind coxae. Antennae: segment I, length .31 mm, pallid; II, 1.26 mm, slender, slightly thicker on apical fourth, about half the thickness of segment I, pallid, apical half fuscous; III, 1.09 mm, fuscous; IV, .37 mm, fuscous.

Color more pallid than in the male, but pubescence very similar.

Holotype: ♂ June 24, 1965, Area 19M, Nevada Test Site (H. H. Knight & J. M. Merino). **Allotype:** ♀ taken with the type. **Paratypes:** 4 ♀ taken with the types. ♂ June 12, 1965, Area 17M, Nevada Test Site; taken on *Malacothrix glabrata*, which could be a host plant.

Hesperocapsus utahensis, new species

Fig. 133

Closely related to *davisi* Kngt., but distinguished by the shorter rostrum; length of antennal segment II subequal to width of pronotum at base; without fuscous dots on femora; also distinguished by form of the right genital clasper (Fig. 133).

Male. Length 6.3 mm, width 2.2 mm. Head: width 1.02 mm, vertex .58 mm. Rostrum, length 1.1 mm, only reaching to near basal margin of mesosternum, pale greenish, apex black. Antennae: segment I, length .44 mm, pallid to pale green; II, 1.56 mm, cylindrical, rather slender, pale pubescent, intermixed with longer, fuscous to black, suberect bristles, pale to greenish; III, 1.15 mm, yellowish to fuscous, slender; IV, .57 mm, fuscous. Pronotum, length .81 mm, width at base 1.5 mm; disk and the head clothed with appressed, silvery, scalelike pubescence, intermixed with erect, rather long, white, bristlelike hairs. Dorsal surface bearing similar scalelike pubescence, thickly intermixed with erect white bristles, but bristles on corium and cuneus chiefly black. Color blue green, ventral surface pallid to blue green. Legs pallid to blue green, femora

without fuscous dots as are present in *davisi*. Ventral surface and femora thickly clothed with both types of pubescence; tibial spines black but without dots at base. Genital segment distinctive, tergal margins with projecting flat, chitinous processes that are specific for the species; claspers also distinctive, the right clasper with posterior dorsal angle projecting more than in *davisi* (Fig. 130).

Holotype: ♂ May 21, 1930, Richfield, Utah (E. W. Davis), collected in a light trap. **Paratypes:** ♂ June 30, 1945, Toiyable Mts., near Austin, Nevada. ♂ July 2, 1945, Sheldon Antelope Refuge, Nevada (specimen badly damaged).

Hesperocapsus sericatus (Uhler)

Fig. 131

Oncotylus sericatus Uhler, 1895:49.

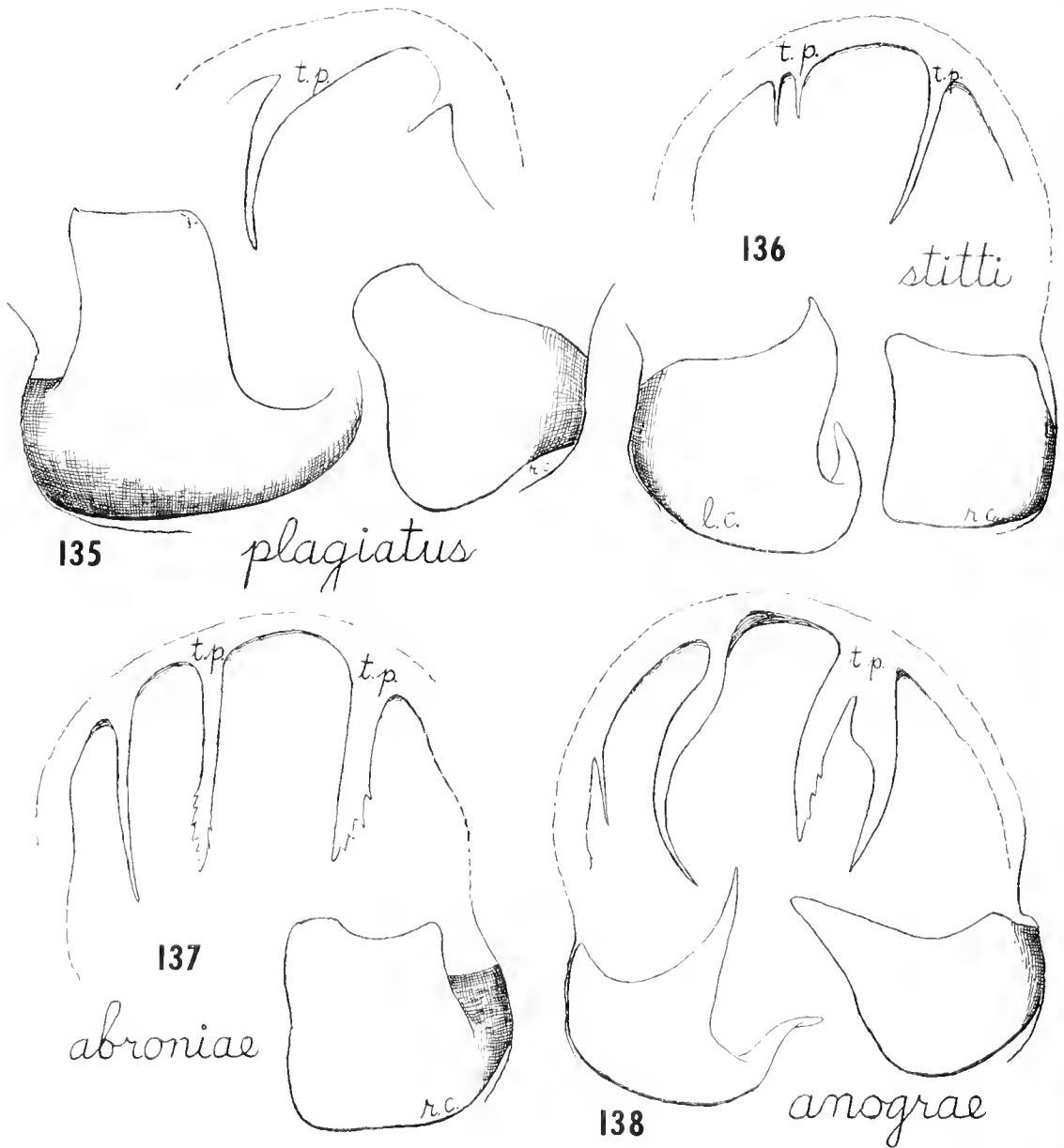
Labopidea sericata Van Duzee, 1916:220.

Pseudopsallus sericatus Knight, 1930:3.

Oncotylus repertus Uhler, 1895:49, new syn.

This species was described under two names on the same page by Uhler (1895) as shown above. I elect to use the name *sericatus* (Uhler) as the species has been known under that name by Van Duzee and the writer. Data for the first specimen mentioned under both descriptions, "Steamboat Springs, July 12th on *Artemisia tridentata* (Baker)" are identical. I herewith designate these specimens as types for the species. In the description of *repertus* Uhler, only two female specimens are mentioned, and I can say the "Steamboat Springs" specimen has been found among material of the Uhler collection, and bears the name label *repertus* in Uhler's hand writing. This type will be recorded in the U. S. N. M. collection. It now seems clear that the *repertus* females are merely females of the species *sericatus* Uhler, and no doubt were collected together, as the labels are identical.

Baker and Gillette sent odd specimens under numbers to Dr. Uhler for identification, who in turn sent names and descriptions of new species for incorporation in their publication, Bulletin 31 (1895). Uhler did not recognize the brachypterous females (*repertus*) as being the opposite sex of the macropterous males he described as *sericatus*. Evidently Uhler retained all specimens sent to him, for I failed to find any specimens with Uhler labels when I examined the Colorado Experiment Station collection in 1925. This is just one of similar problems Uhler created when he failed to mark any specimens of his new species with type labels.



Figs. 135-138. Male claspers. 135, *Hesperocapsus plagiatus*; 136, *H. stitti*; 137, *H. abroniae* (Kngt.); 138, *H. anograe* (Kngt.).

Hesperocapsus stitti, new species

Fig. 136

Suggestive of *plagiatus*, with the pallid color and fuscous shading, but differs distinctly in form of male left clasper, also in having two short spines and one long, slender process on tergite margin (Fig. 136).

Male. Length 5.9 mm, width 1.9 mm. Head: width 1.05 mm, vertex .41 mm; eyes large and prominent. Rostrum, length 1.6 mm, reaching middle of hind coxae, pallid, apical half brownish, apex black. Antennae: segment I, length

.37 mm, pale fuscous; II, 1.60 mm, cylindrical, thickness a trifle less than segment I, fuscous brown, bearing short pale pubescence; III, 1.1 mm, fuscous brown; IV, .40 mm, fuscous. Pronotum, length .85 mm, width at base 1.63 mm; disk moderately convex, pale dusky brown, calli more yellow, lateral margins nearly straight. Mesonotum and scutellum yellowish brown. Dorsal surface pallid to dusky brown and greenish; clothed with silvery sericeous pubescence and intermixed with suberect, pale to yellowish bristlelike hairs. Hemelytra subtranslucent, darkened with pale dusky brown, embolium and

cuneus more pallid and shaded with green; membrane pale dusky brown, veins pallid. Ventral surface pallid to light dusky brown. Legs pallid to dusky brown, hind femora with a few fuscous dots; tibial spines dusky brown. Venter pallid to greenish; genital segment distinctive, tergite with two small, short spinelike processes to left of median line, and one long slender process on the right side (Fig. 136).

Female. Length 6.1 mm, width 2.3 mm. Rostrum, length 1.8 mm, reaching to middle of hind coxae. Antennae: segment I, length .41 mm; II, 1.56 mm, cylindrical, slightly more slender on basal half, pallid to greenish yellow; III, 1.19 mm, dusky brown; IV, .41 mm, fuscous. Color pallid to light green, corium more dusky brown. More robust than the male but color and pubescence very similar.

Holotype: ♂ April 14, 1940, Mohawk, Arizona (L. L. Stitt). **Allotype:** ♀ taken with the type. **Paratypes:** 4♂ taken with the types on *Chaenactis*, which should be the host plant. ♂ April 17, 1937; 2♂ March 24, 1939, Yuma County, Arizona (L. L. Stitt).

Hesperocapsus demensus (Van Duzee)

Fig. 132

Orthotylus demensus Van Duzee, 1925:398.

Pseudopsallus demensus Knight, 1930:8.

This species was described from Prescott, Arizona, and I have since recognized it from Larimer County, Colorado. Structures of the genital segment are distinctive, having two tergal processes, the one on the right side bifurcate on apical half (Fig. 132).

Hesperocapsus abroniae (Knight)

Fig. 137

Pseudopsallus abroniae Knight, 1930:5.

A pale dusky species; three tergal processes relates this species to *artemisicola* Kngt. in structure, but size smaller and color different (Fig. 137). This species was described from Fort Lupton, Colorado, where it was breeding on *Abronia elliptica*. It was recorded from Phoenix, Arizona; and now 6♂ April 17, 1937, Yuma County, Arizona (L. L. Stitt).

Hesperocapsus anograe (Knight)

Fig. 138

Pseudopsallus anograe Knight, 1930:4.

General coloration deep blue green; structure of tergal processes and male claspers very

distinctive (Fig. 138). Described from Gunnison, Colorado, where it was breeding on *Anogra coronopifolia*. Now recognized from Arizona, ♂ ♀ March 24, 1939, Yuma County (L. L. Stitt).

Hesperocapsus gaurae, new species

Fig. 139

Allied to *demensus* (Van D.), but differs in form of tergal processes, and in the sharp terminal angle of right clasper (Fig. 139).

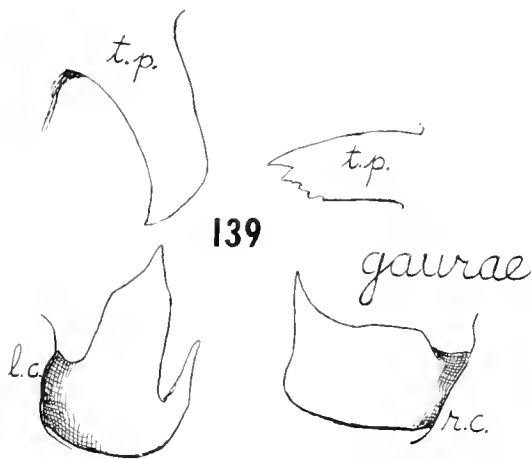


Fig. 139. *Hesperocapsus gaurae*, ♂ claspers

Male. Length 4.7 mm, width 1.7 mm. Head: width .88 mm, vertex .40 mm, yellowish green. Rostrum, length 1.02 mm, reaching to near posterior margin of mesosternum, yellowish, apex black. Antennae: segment I, length .30 mm, greenish yellow; II, 1.19 mm, nearly cylindrical, thickness about equal to three-fourths thickness of segment I, yellowish, clothed with fine, short pale pubescence; III, 1.02 mm, dusky yellow; IV, .44 mm, dusky yellow. Pronotum, length .71 mm, width at base 1.36 mm; disk moderately convex, yellowish green, lateral margins nearly straight. Mesonotum narrowly exposed, scutellum moderately convex, greenish. Dorsal surface rather sparsely clothed with fine, appressed, silvery sericeous pubescence, and rather sparsely intermixed with suberect, pale bristlelike hairs. Hemelytra uniformly green, cuneus somewhat deeper green; membrane uniformly pale fuscous, veins green. Ventral surface pallid to yellowish green. Legs yellowish green, tibial spines brown, tips of tarsi fuscous. Venter pale yellowish green; genital segment distinctive; tergal processes two in number, flat, platelike, distinctive in shape; right clasper with dorsal angle sharply produced (Fig. 139).

Female. Length 4.6 mm, width 1.6 mm. Head: width .88 mm, vertex .44 mm. Antennae: segment I, length .34 mm, dusky yellow; II, 1.36 mm, cylindrical, greenish yellow; III, .98 mm, dusky yellow; IV, .44 mm, fuscous. Color and pubescence very similar to the male.

Holotype: ♂ Aug. 19, 1927, Custer, South Dakota (H. H. Knight). **Allotype:** ♀ taken with the type. **Paratypes:** ♂ taken with the types. ♂ June 24, 1920, Fort Collins, Colorado. ♂ July 10, 1915, Ardmore, South Dakota (E. G. Holt). ♂ July 31, 1927, Moorecroft; ♀ July 30, 1927, Sundance, Wyoming (H. H. Knight), taken on *Gaura coccinea*, which is the host plant.

Squamocoris, new genus

Arolia erect and converging at the apices as in *Orthotylus*; head distinctly oblique, clypeus prominent, angulate on basal half; vertex with basal carina evident but not elevated. Rostrum reaching upon posterior trochanters. Length of

first antennal segment slightly greater than width of vertex plus dorsal width of an eye, rather thick and slightly curved; antennal segment II cylindrical, thickness equal to two-thirds the thickness of segment I; segment III very long, equal to three times or more the length of segment IV. Pronotal disk with basal margin nearly straight, lateral margins distinct, anterior angles carinate, rather sharply produced; median line distinct, marked by a line of white flat scales which continue on median line of the head. Dorsal surface and sides of body rather thickly covered by appressed flat scalelike hairs, sparsely intermixed with simple recumbent to erect simple pubescent hairs. Hemelytra subtranslucent, rather thickly covered with appressed, flat scalelike hairs. Legs pallid, with rows of spots on femora; tibial spines black, with black spot at base of each. Male genital segment and claspers distinctive. Female unknown, but probably brachypterous. Type of the genus: *Squamocoris utahensis*, new species.

Key to the Species

1. First antennal segment white, black beneath, dorsal aspect with black spots, apex black; length 6.4 mm *utahensis*, n. sp.
- First antennal segment pallid to dusky yellow, not black beneath, without black spots; length 5.2 mm *arizonae*, n. sp.

Squamocoris utahensis, new species

Fig. 140

Allied to *arizonae* but distinguished by the black pronotal disk with white median line.

Male. Length 6.6 mm, width 1.9 mm. Head: width .98 mm, vertex .48 mm; frons and vertex brownish black, median line pallid, bearing appressed, flat, white scalelike hairs; clypeus pallid, sides and median line at base, blackish, angulate at middle. Rostrum, length 1.7 mm, reach-

ing to middle of hind coxae. Antennae: segment I, length .92 mm, beneath fuscous to black, dorsal aspect white, apex and 3 or 4 spots brownish black; II, 2.14 mm, cylindrical, yellowish brown, a pale to white annulus at base; III, 1.9 mm, fuscous brown; IV, .54 mm, short as compared with III. Pronotum, length .78 mm, width at base 1.4 mm; disk brownish black, median line and lateral edges white, thickly clothed with appressed white scales, as on the head; propleura pallid to white, dorsal half brownish black. Mesoscutum rather broadly exposed, brownish black. Scutellum moderately convex, brownish black, median line which widens on apex, pallid. Dorsal surface sparsely clothed with suberect, simple pale hairs, intermixed with appressed white and black, flat scalelike hairs, the mixture about half and half on hemelytra; sides of body also bearing the flat scalelike hairs.

Hemelytra elongate, pallid to dusky white, claval and radial veins appear elevated, pallid and stand out as ridges; the black and golden brown flat scales are conspicuous on the pallid



Fig. 140. *Squamocoris utahensis*, ♂ claspers.

surface. Membrane pallid, shaded with fuscous, somewhat darker behind the areoles, veins white. Mesosternum and pleura brownish black, ostiolar peritreme pallid, but fuscous in the ostiole. Legs pallid, femora with several small and large brownish black spots, dorsal aspect with several larger spots; tibiae pallid, black spines with black spot at base of each; tarsi brownish black. Venter pale to fuscous, a moderately broad black lateral band or line. Genital segment and claspers distinctive. The species is known only from males that come to lights; the females are probably brachypterous.

Holotype: ♂ July 3, 1929, Richfield, Utah (E. W. Davis), at light trap. **Paratypes:** ♂ June 6, 1931, Hubbs Butte, Idaho, taken in light trap. ♂ June 8, 1961, 9 mi SW of Winnemucca, Humboldt County, Nevada (F. D. Parker).

Squamocoris arizonae, new species

Separated in the key; first antennal segment unspotted, not blackish beneath.

Male. Length 5.2 mm, width 1.5 mm. Head: width .75 mm, vertex .37 mm; pallid to yellowish, frons with reddish brown transverse striae each side of the pale median line; clypeus with geminate reddish brown lines on basal half. Rostrum, length 1.42 mm, just reaching upon tips of middle coxae. Antennae: segment I, length .71 mm, thickness .17 mm, somewhat thicker on basal half, pale yellowish brown, pubescence and bristles very short; II, 1.6 mm, cylindrical, thickness just half that of segment I, brownish yellow, not paler at base, pubescence very short; III, 1.6 mm, subequal to segment II, yellowish brown; IV, .48 mm, dusky brown. Pronotum, length .72 mm, width at base 1.36 mm; lateral margins of disk rather sharply angulate; pale yellow brown, median line pallid, covered by white flat scales, an extension of the white median line of the head; disk and calli sprinkled with red flecks of color, calli outlined by impressed margins; propleura pallid to yellowish. Mesoscutum narrowly exposed, uniformly pale yellowish like the scutellum. Dorsal surface rather sparsely clothed with short, recumbent yellowish to golden simple pubescent hairs and intermixed with more appressed, sericeous, slender scalelike golden hairs and mixed in with some silvery scalelike hairs, but more thickly on the median line mentioned above.

Hemelytra uniformly pallid, subtranslucent, tip of cuneus more brownish. Membrane pale translucent, tinged with yellowish brown, apical half more dusky brown, veins pallid to white.

Mesosternum fuscous to brown, paler on episternum. Legs pallid, femora yellowish brown, tarsi fuscous brown. Venter pallid to yellowish, with lateral line composed of reddish brown spots; basal half clothed with appressed silvery sericeous scalelike pubescence. Genital segment and claspers distinctive of the species.

Holotype: ♂ May 9, 1926, Salt River Mts., alt. 1300 ft, Arizona (A. A. Nichol). **Paratype:** ♂ same data as the type.

Genus *Noctuocoris* Knight

Noctuocoris fumidus (Van Duzee)

Fig. 141

Orthotylus fumidus Van Duzee, 1916:127.

Noctuocoris fumidus Knight, 1923:523, n. gen.

Noctuocoris fumidus Knight, 1941:105, distr.

Described from Colorado and now known from several northeastern states. New record: ♀ Provo, Utah, 1929 (A. B. Call, Jr.).

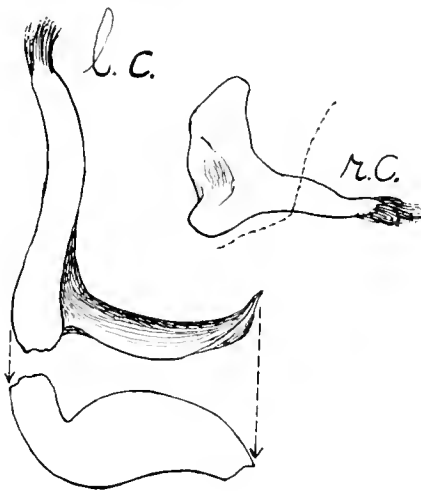


Fig. 141. *Noctuocoris fumidus* (Van D.), ♂ claspers.

Dichaetocoris, new genus

Allied to *Orthotylus* Fieber, arolia erect and converging at apices; differs from related genera in having two types of pubescence, simple recumbent pubescent hairs and intermixed with sericeous to tomentose pubescence, with absence of erect bristles over the dorsal surface. Antennae and legs about as in *Orthotylus*; tibiae without black spots at base of spines. Genital segment and claspers, in form related to *Orthotylus*; claspers often highly modified and showing good specific characters. Type of the genus: *Dichaetocoris pinicola*, new species.

Key to the Species

1. Cuneus red; length 3.5 mm *peregrinus* Van D.
Cuneus not red; sometimes yellowish or golden orange 2
2. Rostrum not reaching beyond posterior margin of mesosternum 3
Rostrum reaching upon middle coxae or beyond 4
3. Rostrum just reaching upon middle of mesosternum; length 5.3 mm.
..... *brevirostris*, n. sp.
Rostrum reaching posterior margin of mesosternum; length 5.6
..... *stanleyaeae*, n. sp.
4. Rostrum reaching upon hind coxae or beyond 5
Rostrum just reaching upon middle coxae; length 2.8 mm *minimus*, n. sp.
5. Rostrum not reaching beyond hind coxae 6
Rostrum reaching slightly beyond hind coxae 8
6. Length of antennal segment II not, or barely exceeding width of pronotum at base 7
Length of antennal segment II clearly exceeding width of pronotum at base; slender, length (♂) 4.7 mm, (♀) 3.7 mm *symphoricarpi*, n. sp.
7. Sericeous pubescence on hemelytra, golden yellow to golden brown; size smaller, length 3.0-3.5 mm *coloradensis*, n. sp.
Sericeous pubescence on hemelytra silvery white; size larger, length (♀) 4.3 mm, (♂) 4.6 mm *nevadensis*, n. sp.
8. Color distinctly greenish or green 9
Color pallid to yellowish, or golden yellow, not green 11
9. Length of antennal segment II greater than width of pronotum at base 10
Length of antennal segment II subequal to width of pronotum at base; male claspers distinctive (Fig. 147), length 3.6 mm-3.7 mm *utahensis*, n. sp.
10. Width of vertex greater than half the width of head; male claspers distinctive (Fig. 146); length 3.6-3.9 mm *juniperi*, n. sp.
Width of vertex not equal to half the width of head; male claspers distinctive (Fig. 150); slender, length 3.4 mm *spinosus* Kngt.
11. Cuneus and hemelytra reddish orange; male right clasper with spinelike teeth on apex (Fig. 143); length 4.4 mm *merinoi*, n. sp.
Cuneus and hemelytra yellowish; male right clasper bifurcate on apex (Fig. 142); length 3.8-4.1 mm *pinicola*, n. sp.

Dichaetocoris pinicola, new species

Fig. 142

Runs in the key to the couplet with *merinoi* from which it differs by the pale yellowish color; male claspers distinctive, with right clasper bifid on apex (Fig. 142).

Male. Length 4.1 mm, width .56 mm. Head: width .93 mm, vertex .44 mm; yellowish. Rostrum, length 1.53 mm, reaching slightly beyond apices of hind coxae, yellowish, apex black. Antennae: segment I, length .27 mm, pale yellowish; II, 1.22 mm, cylindrical, slender, only half the thickness of segment I, uniformly yellowish;

III, .88 mm, dusky yellow; IV, .34 mm, dusky. Pronotum, length .58 mm, width at base 1.22 mm; form similar to *juniperi*. Dorsal surface light brownish yellow, clothed with recumbent and appressed, yellowish to golden sericeous pubescence, intermixed with more erect, simple yellowish to golden pubescent hairs. Membrane pale fuscous, veins golden yellow. Ventral surface pale yellowish; legs uniformly pallid, with a tint of yellow; tibial spines golden yellow. Genital segment distinctive, having a small tergal process on middle above genital cavity; claspers distinctive, right clasper bifid on apex (Fig. 142).

Female. Length 3.8 mm, width 1.56 mm. Head: width .95 mm, vertex .47 mm. Antennae: segment I, length .30 mm; II, 1.19 mm, cylindrical, more slender than in the male; III, .88 mm; IV, .34 mm; uniformly brownish yellow. Pronotum, length .58 mm, width at base 1.26 mm. Color and pubescence very similar to the male.

Holotype: ♂ June 23, 1965, Area 18M, Nevada Test Site (H. H. Knight & J. M. Merino).

Allotype: ♀ same data as the type. **Paratypes:** 35♂ 3♀ collected with the types on *Pinus monophylla*, which is the host plant of the species. ♂ ♀ June 23, 1965, Area 18M; 16♂ 9♀ June 19, 1965, Area 40IM, Nevada Test Site (H. H. Knight & J. M. Merino), all collected on *Pinus monophylla*. 2♂ 5♀ June 29, 1965, Scipio, Utah (H. H. Knight).

Dichaetocoris peregrinus (Van Duzee)

Fig. 145

Atomoscelis peregrinus Van Duzee, 1918:303, n. sp.

Parthenicus peregrinus Carvalho, 1958:123, cat.

Allied to *symphoricarpi* but easily distinguished by the red cuneus.

Male. Length 3.5 mm, width 1.2 mm. Head: width .71 mm, vertex .34 mm; green, vertex and frons bearing silvery, sericeous pubescence. Rostrum, length 1.12 mm, reaching upon posterior trochanters, pallid to green, apex blackish. Antennae: segment I, length .18 mm, thickness .07 mm, fuscous to black beneath, pale greenish above; II, .98 mm, cylindrical, slightly thicker (.07 mm) near apex, pallid to greenish, clothed with very fine pallid pubescence; III, .85 mm, slender, pale to green; IV, .34 mm, greenish. Pronotum, length .54 mm, width at base 1.10 mm; disk moderately convex, basal margin slightly arcuate, lateral margins nearly straight, angulate in joining propleura; disk, scutellum

and hemelytra thickly clothed with appressed, silvery, sericeous pubescence, easily lost by contact, and intermixed with recumbent, pale pubescent hairs. Mesonotum narrowly exposed, scutellum black, calli fuscous. Hemelytra green, inner apical angle of corium narrowly fuscous, bearing a few fuscous, sericeous hairs; embolar margins nearly straight, parallel, cuneus red, slender outer margin and apex pallid. Membrane pale fuscous, veins pale yellow. Ventral surface of thorax fuscous, sides and venter bearing silvery, sericeous pubescence. Legs green, tarsi fuscous, spines and pubescence pallid. Venter green, bearing typical pubescence; genital segment and claspers distinctive (Fig. 145).

Female. Length 3.4 mm, width 1.43 mm. Head: width .78 mm, vertex .44 mm. Antennae: segment I, length .20 mm, yellowish; II, 1.02 mm, slender, slightly thicker near apex, yellowish green; III, .71 mm, slender, dusky green; IV, .28 mm, dusky. Pronotum, length .58 mm, width at base 1.19 mm. Scutellum yellowish to green, apparently never black in the female. Color, except the scutellum, and the pubescence very similar to the male.

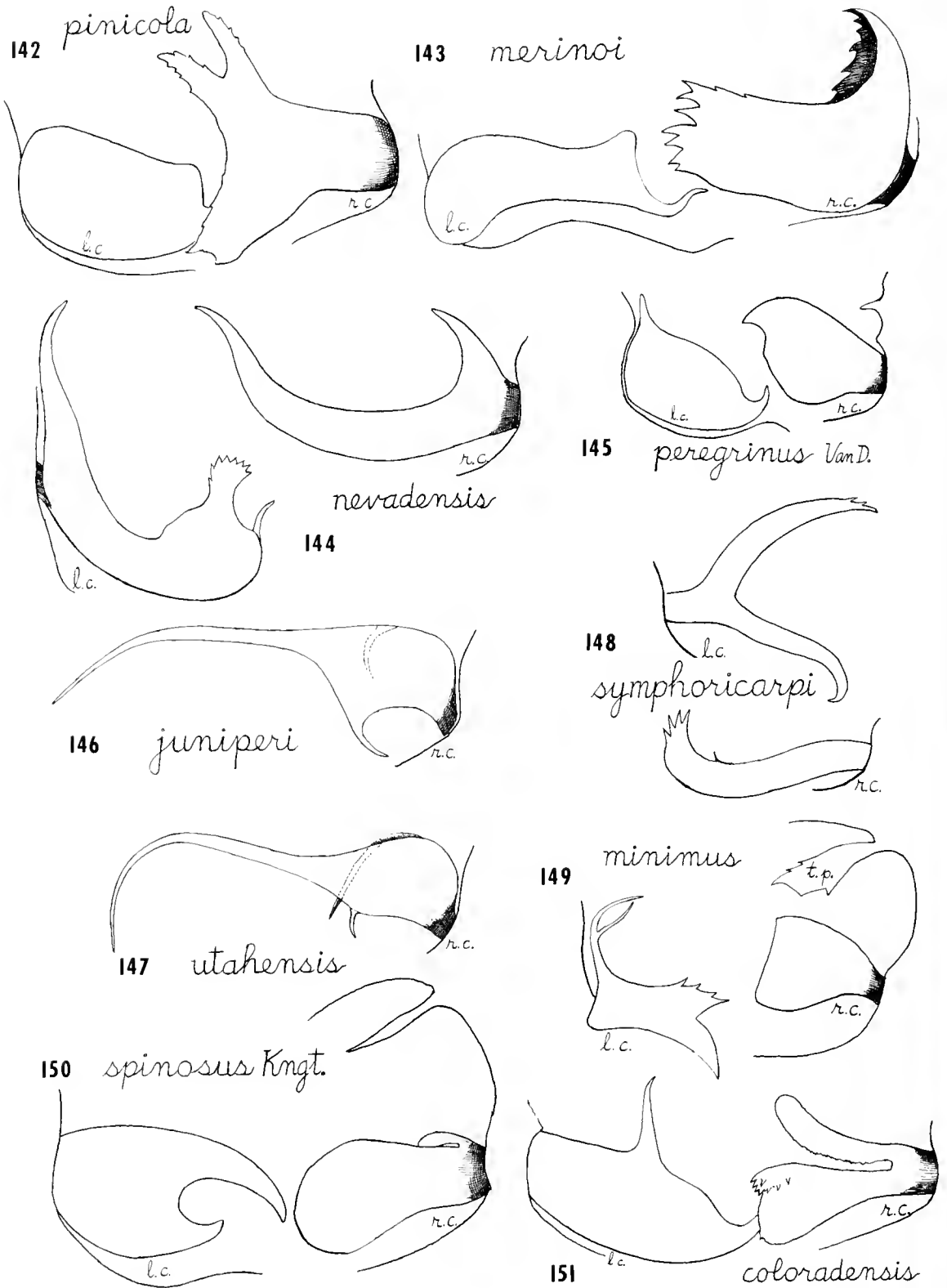
Records for the Nevada Test Site: Area 40IM, 9♂ 49♀ June 18, 1965, taken on *Dalea polyadenia*, which is the host plant of the species; Area 12M, ♀ June 11, 1965; Area 18M, ♀ July 14, 1965; Area CM, 2♂ 8♀ June 13, 1965, taken on *Dalea polyadenia*.

Dichaetocoris merinoi, new species

Fig. 143

Allied to *pinicola* but separated in the key by the reddish orange cuneus, and male right clasper with spinelike teeth on apex (Fig. 143).

Male. Length 4.4 mm, width 1.46 mm. Head: width 1.0 mm, vertex .47 mm; yellowish. Rostrum, length 1.8 mm, reaching behind coxae to fifth ventral segment. Antennae: segment I, length .30 mm, yellowish; II, 1.36 mm, cylindrical, thickness about two-thirds that of segment I, brownish yellow; III, .92 mm, dusky yellow; IV, .44 mm, fuscous. Pronotum, length .68 mm, width at base 1.36 mm; disk slightly convex, basal margin broadly arcuate, lateral margins nearly straight, yellowish to brownish yellow. Mesonotum narrowly exposed. Scutellum triangular, smooth, slightly convex, light yellowish orange. Dorsal surface clothed with two types of pubescence, with appressed, silvery to golden, sericeous hairs, intermixed with recumbent to suberect, yellowish to golden, simple pubescent hairs. Hemelytra golden yellow to



Figs. 142-151. Male claspers. 142, *Dichaetocoris pinicola*; 143, *D. merinoi*; 144, *D. nevadensis*; 145, *D. peregrinus* (Van D.); 146, *D. juniperi*; 147, *D. utahensis*; 148, *D. symphoricarpi*; 149, *D. minimus*; 150, *D. spinosus* (Kngt.); 151, *D. coloradensis*.

reddish orange, deeper color on cuneus, embolium pale yellow, embolar margin slightly curved. Membrane light fuscous, veins reddish orange. Ventral surface pallid to pale yellowish. Legs pale yellowish, tibial spines golden yellow. Genital segment and claspers distinctive; right clasper with spinelike teeth on apex (Fig. 153).

Female. Length 4.4 mm, width 1.8 mm. Head: width 1.05 mm, vertex .51 mm. Antennae: segment I, length .31 mm; II, 1.3 mm, cylindrical, more slender than in the male; III, .88 mm, dusky yellow; IV, .37 mm, fuscous. Pronotum, length .68 mm, width at base 1.49 mm. More robust than the male, but very similar in color and pubescence.

Holotype: ♂ June 23, 1965, Area 19M, Nevada Test Site (H. H. Knight & J. M. Merino). **Allotype:** ♀ same data as the type. **Paratypes:** 4♂ taken with the types on *Pinus monophylla*, the host plant. ♂ June 24, 1965, Area 19M; ♂ June 23, 1965, Area 18M (H. H. Knight & J. M. Merino); ♂ July 13, 1965, Area 12M, Nevada Test Site (D E. Beck & J. M. Merino).

Dichaetocoris nevadensis, new species

Fig. 144

Allied to *juniperi*, but distinguished in the key.

Male. Length 4.5 mm, width 1.7 mm. Head: width .92 mm, vertex .37 mm; yellowish, vertex with a few erect, curving fuscous hairs. Rostrum, length 1.42 mm, reaching upon apex of hind coxae. Antennae: segment I, length .30 mm, thickness .08 mm, greenish yellow; II, 1.25 mm, cylindrical, thickness .07 mm, yellowish, clothed with fine, short pallid pubescence; III, .85 mm, dusky yellow; IV, .37 mm, dusky. Pronotum, length .61 mm, width at base 1.30 mm; basal margin very slightly sinuate, lateral margins nearly straight, disk moderately convex, impunctate. Mesonotum moderately exposed, scutellum triangular, moderately convex. Dorsal surface pallid to pale greenish; clothed with a moderate amount of appressed, silvery sericeous pubescence, and intermixed with recumbent to suberect, simple pallid or yellowish pubescent hairs. Hemelytra with lateral margins nearly straight, pallid to greenish; membrane and veins uniformly pale dusky yellow. Ventral surface pale yellowish, tinted green. Legs pale yellowish, pubescence and tibial spines pallid to pale yellowish. Male claspers distinctive (Fig. 144).

Female. Length 4.3 mm, width 1.7 mm. Head: width .98 mm, vertex .51 mm. Antennae:

segment I, length .30 mm, thickness .10 mm, pallid; II, 1.36 mm, slender, pale yellowish; III, .92 mm, dusky; IV, .34 mm, dusky. Pronotum, length .65 mm, width at base 1.33 mm. Color pallid to pale greenish; pubescence very similar to that of the male.

Holotype: ♂ June 13, 1965, Area 18M, Nevada Test Site (H. H. Knight & J. M. Merino). **Allotype:** ♀ same data as for the type. **Paratypes:** 12♂ 10♀ taken with the types on *Pinus monophylla* which is the host plant. ♂ ♀ July 13, 1965, Area 12M (D E. Beck & J. M. Merino); 4♂ 1♀ June 19, 1965, Area 401M, Nevada Test Site (H. H. Knight & J. M. Merino).

Dichaetocoris juniperi, new species

Fig. 146

Allied to *pinicola* but distinguished in the key and by the structure of male genital segment and claspers (Fig. 146).

Male. Length 3.5 mm, width 1.4 mm. Head: width .86 mm, vertex .44 mm; yellowish green. Rostrum, length 1.36 mm, reaching slightly beyond tips of hind coxae, greenish to yellowish, apex black. Antennae: segment I, length .27 mm, yellowish, thickness .08 mm; II, 1.22 mm, cylindrical, thickness .07 mm, yellowish; III, .75 mm, dusky yellow; IV, .34 mm, dusky. Pronotum, length .54 mm, width at base 1.17 mm, disk moderately convex, basal margin broadly arcuate, lateral margins nearly straight; clothed with recumbent, yellowish sericeous pubescence, more thickly about the calli, and intermixed with more erect yellowish to golden pubescent hairs, anterior margin with a few fuscous bristles. Mesonotum moderately exposed, yellowish. Scutellum triangular, moderately convex, bearing simple, golden pubescent hairs. Hemelytra golden yellow, embolium more green, clothed with recumbent and appressed, yellowish to golden, sericeous pubescence, intermixed with more erect, golden simple pubescent hairs; Hemelytra golden yellow, embolium more green, clothed with recumbent and appressed, yellowish to golden, sericeous pubescence, intermixed with more erect, golden simple pubescent hairs; cuneus golden yellow, outer margin greenish; membrane pale fuscous, veins golden yellow. Ventral surface greenish, mesosternum golden yellow. Legs greenish, tibiae more pallid, tibial spines golden, tarsi yellowish. Venter green, in part pallid on median ventral surface. Genital segment distinctive, bearing rather large and remarkably developed claspers (Fig. 146).

Female. Length 3.7 mm, width 1.5 mm. Head: width .92 mm, vertex .50 mm; green,

bearing yellowish sericeous hairs, also with several erect fuscous hairs. Antennae: segment I, length .27 mm, pallid to yellowish; II, 1.19 mm, cylindrical, yellowish; III, .78 mm, dusky yellow; IV, .34 mm, dusky. Pronotum, length .58 mm, width at base 1.28 mm. Color more strongly green, from green in the hypodermis, hemelytra not golden yellow as in the male; but pubescence very similar to the male. Ventral surface and legs strongly green; tibial spines golden to copper colored.

Holotype: ♂ June 19, 1965, Area 40IM, Nevada Test Site (H. H. Knight & J. M. Merino). **Allotype:** ♀ same data as the type. **Paratypes:** 5♂ 15♀ taken with the types on *Juniperus osteosperma*, which is the host plant for the species. 8♂ 11♀ June 23, 1965, Area 18M; 3♂ 7♀ June 23, 1965, Area 19M; ♂ June 22, 1965, Area 40IM, Nevada Test Site (H. H. Knight & J. M. Merino), taken on *Juniperus osteosperma*.

Dichaetocoris utahensis, new species

Fig. 147

Runs in the key to the couplet with *juniperi*, from which it differs by the somewhat shorter second antennal segment, also by structure of the male claspers (Fig. 147).

Male. Length 3.7 mm, width 1.42 mm. Head: width .88 mm, vertex .44 mm; pallid to yellowish green. Rostrum, length 1.4 mm, reaching upon tips of posterior trochanters to near middle of venter, pale yellowish, apex brownish black. Antennae: segment I, length .27 mm, pale yellowish; II, 1.25 mm, cylindrical, more slender than segment I, pale yellowish; III, broken. Pronotum, length .54 mm, width at base 1.19 mm; pallid to dusky green. Dorsal surface clothed with sparsely set, recumbent to suberect, yellowish to golden brown, simple hairs, intermixed with recumbent and appressed, silvery to yellowish, sericeous pubescence. Hemelytra pallid, to dusky yellowish green, embolium more pallid; cuneus yellowish green. Membrane pale to dusky or pale fuscous, uniformly shaded, veins pale or dusky yellow. Venter and legs pallid to light greenish yellow, sides of venter tinted greenish. Genital segment and claspers distinctive of the species (Fig. 147).

Female. Length 3.6 mm, width 1.4 mm. Head: width .88 mm, vertex .47 mm. Rostrum, length 1.5 mm, reaching to base of ovipositor. Antennae: segment I, length .27 mm; II, 1.22 mm, cylindrical, pale dusky yellow; III, .68 mm, dusky; IV, .27 mm, dusky. Pronotum, length .56

mm, width at base 1.26 mm. Color and pubescence very similar to the male.

Holotype: ♂ June 29, 1965, near Scipio, Utah (H. H. Knight), sweeping Juniper, along Hwy. US 91, about one mile north of the historical marker on highway at top of the ridge. **Allotype:** ♀ taken with the type. **Paratype:** ♂ taken with the types.

Dichaetocoris symphoricarpi, new species

Fig. 148

Distinguished from other members of the genus by the slender form, long rostrum and uniformly apple green color; pubescence composed of pallid simple recumbent hairs intermixed with appressed, silvery sericeous pubescence.

Male. Length 4.7 mm, width 1.6 mm. Head: width .81 mm, vertex .41 mm; green. Rostrum, length 1.19 mm, reaching upon apex of hind coxae; first segment very thick, twice as thick as second segment, green, apex blackish. Antennae: segment I, length .34 mm, thickness .10 mm, pale green; II, 1.3 mm, cylindrical, slender, thickness only half that of segment I; III, .88 mm, slender, pale yellowish; IV, .34 mm, dusky. Pronotum, length .58 mm, width at base 1.19 mm; disk only slightly convex, basal margin nearly straight, lateral margins also straight, not carinate. Mesonotum narrowly exposed, scutellum triangular, moderately convex. Hemelytra and the whole dorsal surface uniformly apple green in color, the pigment occurs in the hypodermis and may coagulate a bit in spots; clothed with appressed, silvery, sericeous pubescence, and intermixed with recumbent, simple, pale pubescence. Membrane pale fuscous, veins green. Ventral surface pallid to pale green. Legs pale green, tibial spines and pubescence pallid. Genital segment distinctive, claspers large and distinctive (Fig. 148).

Female. Length 3.7 mm, width 1.6 mm. Head: width .82 mm, vertex .47 mm; yellowish green, more pallid on lower half. Rostrum, length 1.22 mm, first segment twice as thick as the second, reaching upon apex of hind coxae. Antennae: segment I, length .31 mm, thickness twice that of segment II; II, 1.26 mm, cylindrical, apex scarcely thicker than base, pale green, with fine, short pallid pubescence; III, .85 mm, dusky green; IV, .34 mm, pale fuscous. Pronotum, length .54 mm, width at base 1.10 mm; disk rather flat. Color and pubescence very similar to the male, but hemelytra broader and shorter, a few specimens nearly brachypterous.

Holotype: ♂ June 16, 1965, Area 17M, Nevada Test Site (H. H. Knight & J. M. Merino). **Allotype:** ♀ same data as the type. **Paratypes:** 30♂ 7♀ taken with the types on *Symphoricarpos longifloris*. 10♂ 1♀ June 12, 1965, Area 17M; 26♂ 24♀ June 17, 1965, Area 17M, Nevada Test Site (D. E. Beck, H. H. Knight & J. M. Merino), also collected on the host plant *Symphoricarpos longifloris*.

Dichaetocoris stanleyaca, new species

Fig. 152

Allied to *brevirostris* but with rostrum reaching to posterior margin of mesosternum; male genital claspers distinctive (Fig. 152).

Male. Length 5.6 mm, width 1.5 mm. Head: width .88 mm, vertex .41 mm; base of clypeus visible when viewed from above, yellowish green. Rostrum, length 1.09 mm, reaching to posterior margin of mesosternum, greenish, apex black. Antennae: segment I, length .52 mm, green, thickness .13 mm; II, 1.73 mm, cylindrical, slightly more slender near base, thickness .08 mm, on apical half, yellowish green; III, 1.42 mm, fuscous; IV, .44 mm, fuscous. Pronotum, length .71 mm, width at base 1.34 mm; disk only slightly convex, basal margin nearly straight, rounded at basal angles, lateral margins nearly straight, sharply turned down to propleura; uniformly green. Mesonotum moderately exposed, green; scutellum moderately convex, green. Dorsal surface clothed with rather fine, appressed, sericeous, deciduous, scalelike silvery hairs, and intermixed with simple, rather sparsely spaced, recumbent to suberect, yellowish to golden pubescence. Hemelytra uniformly green; membrane pale to dusky, veins green. Ventral surface green, sternum paler. Legs green, tarsi yellowish, apical segment and claws black; tibial spines brown to fuscous, but without spots at base. Venter deep green, claspers rather simple but distinctive (Fig. 152).

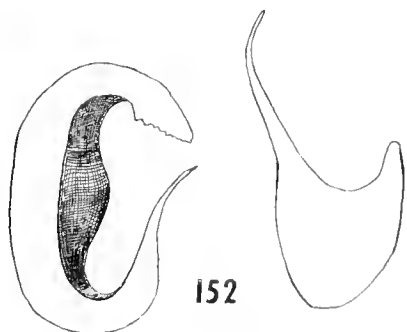


Fig. 152. *Dichaetocoris stanleyaca*, ♂ claspers.

Female. Length 5.6 mm, width 1.9 mm; yellowish green. Rostrum, length 1.25 mm, reaching upon basal margin of mesosternum, yellowish, apex black. Antennae: segment I, length .54 mm, thickness .15 mm, greenish yellow; II, 2.05 mm, cylindrical, slender, thickness .08 mm, greenish yellow; III, 1.46 mm, yellowish to fuscous; IV, .44 mm, fuscous. Pronotum, length .81 mm, width at base 1.5 mm. More robust than the male but very similar in color and pubescence.

Holotype: ♂ June 12, 1965, Area 5M, Nevada Test Site (D. E. Beck, H. H. Knight & J. M. Merino). **Allotype:** ♀ taken with the type. **Paratypes:** 11♀ taken with the type by sweeping *Stanleya pinnata* in the southeastern part of Frenchman Flat; ♀ June 10, 1964, Area 5HN, Nevada Test Site.

The limited number of specimens taken indicates the adult season was nearly over for this species. The males of a species emerge first, then are the first to die off near the end of their season, while the females having mated live longer to lay eggs over a period of ten days or more.

Dichaetocoris brevirostris, new species

Distinguished from known species of the genus by the short rostrum, which reaches only to middle of mesosternum.

Female. Length 5.3 mm, width 2.1 mm. Head: width 1.05 mm, vertex .58 mm; yellowish green. Rostrum, length .95 mm, just reaching to middle of mesosternum, greenish yellow, apex black. Antennae: segment I, length .34 mm, thickness .13 mm, yellowish green; II, 1.63 mm, cylindrical, slender, thickness .068 mm, yellowish green, apex fuscous; III, .61 mm, blackish, narrowly pale at base; IV, .61 mm, blackish. Pronotum, length .85 mm, width at base 1.7 mm; disk moderately convex, basal margin nearly straight where it crosses mesonotum, basal angles gradually rounded, lateral margins nearly straight, angulate but not carinate in turn down to propleura; calli moderately convex, inner angles and basal margin marked by impressed line. Pronotum, scutellum and hemelytra apple green, clothed with recumbent and appressed, silvery, sericeous pubescence, intermixed with recumbent to suberect, pale to yellowish simple pubescent hairs. Mesonotum moderately exposed; scutellum triangular, moderately convex, rising rather sharply at margins to a nearly level convex plateau. Hemelytra subtranslucent, the green pigment visible in the

hypodermal layer; embolar margins slightly curved, cuneus deeper green. Membrane nearly clear, yet dusky in certain angles of light, veins green. Ventral surface pale yellowish green; with limited amounts of sericeous pubescence on sides of thorax. Legs light green, tibiae deeper green, spines fuscous to black, tarsi fuscous. Venter rather uniformly light green, moderately clothed with pallid, suberect pubescent hairs.

Holotype: ♀ June 18, 1965, Area 401M, Nevada Test Site (H. H. Knight & J. M. Merino).

Dichaetocoris minimus, new species

Fig. 149

Distinguished by the small size and by the short rostrum which reaches only upon the middle coxae; male claspers very distinctive (Fig. 149).

Male. Length 2.8 mm, width 1.10 mm. Head: width .68 mm, vertex .32 mm; yellowish. Rostrum, length .72 mm, reaching upon middle coxae, yellowish, apex black. Antennae: segment I, length .17 mm, yellowish; II, broken. Pronotum, length .40 mm, width at base .98 mm; yellowish to green. Scutellum yellowish. Hemelytra pale yellowish to green, deeper green on clavus and outer half of corium, cuneus stronger green; the green hypodermal color tends to coagulate in marginal areas. Membrane pallid, tinged with pale fuscous, veins pallid. Dorsal surface clothed with simple pale to yellowish sericeous pubescence, and sparsely intermixed with pale to yellowish sericeous pubescence. Ventral surface pale yellowish to green; venter more pallid beneath, greenish on sides. Genital segment and claspers very distinctive (Fig. 149); tergum with a broad, flat process on right side of median line.

Holotype: ♂ Aug. 7, 1928, Cove Fort, Utah (E. W. Davis).

Dichaetocoris coloradensis, new species

Fig. 151

In the key this species runs to the couplet with *nevadensis*, but may be distinguished by the smaller size, golden sericeous pubescence, and by structure of the male genital claspers.

Male. Length 3.0 mm, width 1.2 mm. Head: width .81 mm, vertex .40 mm, greenish yellow. Rostrum, length .75 mm, reaching upon posterior trochanters. Antennae: segment I, length .20 mm, yellowish; II, .98 mm, cylindrical, thickness only slightly less than segment I, greenish yellow; III, .54 mm, dusky yellow; IV,

missing. Pronotum, length .47 mm, width at base 1.02 mm; greenish yellow. Scutellum yellowish to green. Dorsal surface sparsely clothed with recumbent to suberect, golden yellow hairs, intermixed with recumbent to appressed, golden yellow to golden, sericeous pubescence. Hemelytra green, embolium pallid, cuneus green. Membrane translucent, uniformly shaded with light fuscous; veins yellow. Ventral surface pale yellowish, femora, sides of venter and propleura more green. Genital segment and claspers distinctive of the species (Fig. 151).

Female. Length 3.5 mm, width 1.3 mm. Head: width .88 mm, vertex .47 mm. Rostrum, length 1.05 mm, reaching upon base of posterior trochanters. Antennae: segment I, length .22 mm; II, .98 mm; III, .64 mm; IV, .24 mm. Pronotum, length .54 mm, width at base 1.12 mm. More robust than the male, but very similar in coloration and pubescence.

Holotype: ♂ Aug. 13, 1925, Durango, Colorado (H. H. Knight). **Allotype:** ♀ taken with type. **Paratypes:** 5♂ 7♀ taken with the types by sweeping junipers. ♂ ♀ Aug. 14, 1925, Mesa Verde National Park, Colorado (H. H. Knight).

Dichaetocoris spinosus (Knight)

Fig. 150

Orthotylus spinosus Knight, 1925:43, n. sp.

This species was described as an *Orthotylus*, but is clothed with two types of pubescence; yellowish to dusky, bearing simple pubescence, and intermixed on hemelytra with more recumbent, sericeous, golden pubescence, which places it in our new *Dichaetocoris*. The species is known from Colorado and several localities in Arizona, where I collected it on *Juniperus pachyphloea* and *J. monosperma*. This species may well occur in Nevada inasmuch as it breeds on two or more species of Juniper in Arizona.

Genus *Orthotylus* Fieber

Orthotylus angulatus (Uhler)

Diommatus angulatus Uhler, 1895:44.

Orthotylus angulatus Van Duzee, 1916:115.

Orthotylus angulatus Knight, 1927:40.

This species was described from Colorado. I found it at Steamboat Springs, July 1964, breeding on *Populus latifolia*. Records from Utah: ♂ ♀ June 28, 1965, American Fork; ♂ ♀ June 29, 1965, Cedar City (H. H. Knight), all taken on *Populus*. ♂ ♀ June 11, 1930, Richfield (E. W. Davis), taken at light. 2♀ Zion National Park (V. M. Tanner).

Orthotylus vigilax Van Duzee

Orthotylus vigilax Van Duzee, 1923:155.

This small green species may be recognized by the short rostrum which only attains middle of mesosternum; head short, eyes large, dorsal width of an eye slightly greater than width of vertex.

Known from Death Valley, California, where it occurs on mesquite, *Prosopis juliflora*. It is also known from Nogales, Mohawk, and Yuma Counties, Arizona. This species is a likely candidate to drift in on the wind and colonize on the mesquite trees at Cane Springs at the test site.

Orthotylus ute Knight

Orthotylus ute Knight, 1927:179.

Known from Colorado, Idaho, Montana, and Wyoming. Breeds on *Populus latifolia* in Colorado.

Orthotylus fuscicornis Knight

Orthotylus fuscicornis Knight, 1927:177.

Collected on *Salix* in Colorado; also taken at Kaysville, Utah.

Orthotylus piccicola Knight

Orthotylus piccicola Knight, 1927:180.

Collected in Colorado on spruce, *Picea*.

Orthotylus (Neomecomma) candidatus
Van Duzee

Orthotylus candidatus Van Duzee, 1916:124.

Orthotylus candidatus Knight, 1923:517, Fig. 88.

Orthotylus (Neomecomma) candidatus Southwood, 1953:444.

Breeding on American aspen, *Populus tremuloides*, along the shore of Lake Superior, in Minnesota. New records: ♀ Aug. 12, 1925, Wolf Creek Pass, Colorado; ♂ Aug. 22, 1925, Pingree Park, Colorado (H. H. Knight). ♂ ♀ Aug. 2, 1940, Mt. Timpanogos, alt. 7700 ft, Utah County, Utah (C. L. Hayward).

Genus *Argyrocoris* Van Duzee

Argyrocoris scurrilis Van Duzee

Argyrocoris scurrilis Van Duzee, 1912:479.

Known from Arizona, Utah, Colorado, New Mexico, and Texas. Only one species is known in this genus, and it occurs in desert areas.

Genus *Melanotrichus* Reuter

Key to the Species

- 1. Dorsal surface bearing appressed, black scalelike hairs 2
- Dorsal surface bearing appressed, silvery scalelike hairs 16
- 2. Genital segment with a tergal process 3
- Genital segment without a tergal process 13
- 3. Male right clasper bifurcate on apex 4
- Male right clasper not bifurcate on apex 8
- 4. Antennal segments I and II black *tibialis* Van D.
- Antennal segments not black 5
- 5. Tergal process broad, flat, bifurcate, the longer part curved strongly upward (Fig. 162) *malvastri*, n. sp.
- Tergal process not curved upward on apical half 6
- 6. Rostrum short, only reaching posterior margin of mesosternum; length of second antennal segment slightly greater than width of pronotum at base *brevirostris* Kngt.
- Rostrum reaching apices of middle coxae; length of second antennal segment not exceeding width of pronotum at base 7

7. Male right clasper with bifurcate prongs long and curved upward (Fig. 165) *chelifer* Kngt.
 Male right clasper with bifurcate prongs shorter, not curved upward (Fig. 164) *custeri*, n. sp.
8. Antennae black; tergal margin with a small, short spine on middle (Fig. 158) *atricornis* Kngt.
 Antennae not black 9
9. Male right clasper with a dorsal prong near middle (Fig. 159) *nicholi* Kngt.
 Male right clasper without dorsal prong 10
10. Male right clasper sinuate on dorsal margin, more slender on apical half, acuminate apex curved upward (Fig. 165) *azteci*, n. sp.
 Male right clasper not sinuate, apex not curved upward 11
11. Tergal process broad, platelike, outer margin of right side with a long slender spine (Fig. 161) *incurtus* Kngt.
 Tergal process not so broad, without spine on right side 12
12. Right clasper with apex terminating in a curved sharp spine (Fig. 155) *viridicatus* Uhler
 Right clasper terminating in a flat, sharp pointed blade; tergal process bifid on apex (Fig. 160) *althacae* Hussey
- 13(2). Antennal segment I pallid to greenish 14
 Antennal segment I fuscous to black 15
14. Male right clasper with ventral margin forming a straight line, apex not turned upward (Fig. 156) *ferox* Van D.
 Male right clasper with ventral margin curved slightly upward on apical half (Fig. 166) *nevadensis*, n. sp.
15. Right clasper bifid on apical fourth, dorsal fork without subspines, approximately equal to ventral fork (Fig. 167) *shoshonca*, n. sp.
 Right clasper notched slightly beyond middle, dorsal fork with subspines (Fig. 157) *inconspicuus* Uhler
- 16(1). Membrane with a fuscous cloud or spot just behind the clear area by apex of cuneus, where the fuscous is stronger than elsewhere; between areoles vein green, as well as membrane bordering each side of vein *coagulatus* Uhler
 Membrane not so marked with fuscous and green 17
17. Bristles on dorsal surface pallid or yellowish 18
 Dorsal surface with golden brown or black bristles 19
18. Length of first antennal segment equal to width of vertex; length of segment II subequal to twice the width of head; length 4.2 mm *wileyae* Kngt.
 Length of first antennal segment not equal to width of vertex; length of segment II not equal to twice the width of head; length 4.6 mm *pallens*, n. sp.

19. Embolium and corium exterior to radial vein clear translucent; length 5.4 mm *albocostatus* Van D. 20
 Embolium and corium not clear or different from other areas of corium 20
20. Bristles on dorsal surface golden brown 21
 Bristles on dorsal surface fuscous to black 25
21. Rostrum reaching upon hind coxae, or beyond 22
 Rostrum only reaching upon middle coxae 23
22. Rostrum reaching upon hind coxae; length 4.4 mm *atriplicis*, n. sp.
 Rostrum reaching behind posterior coxae; length 3.3 mm *brindleyi*, n. sp.
23. Length of second antennal segment distinctly greater than width of pronotum 24
 Length of second antennal segment subequal to width of pronotum at base; male left clasper forming over half of a semicircle (Fig. 147); length 3.2 mm *utahensis*, n. sp.
24. Male left clasper not forming half a semicircle (Fig. 172); color pallid, membrane nearly clear; length 3.4 mm *stitti*, n. sp.
 Male left clasper forming more than half a semicircle (Fig. 174); color green, membrane uniformly fuscous; length 3.0 mm *uniformis*, n. sp.
25. Pallid to white, spotted with blue green 26
 Color yellowish to grass green, the green color not aggregated into spots; length 4.6 mm *mistus* Kngt.
26. Rostrum reaching beyond apex of hind coxae *eurotiae*, n. sp.
 Rostrum almost attaining apex of hind coxae *senectus* Van D.

Melanotrichus viridicatus (Uhler)

Fig. 155

Orthotylus viridicatus Uhler, 1895:48.

Melanotrichus viridicatus Knight, 1927:142.

Records from the Nevada Test Site: Area 16M, ♀ Aug. 17, 1965; Area 19M, 4 ♀ June 22, 1965.

This species is also known from Colorado, Wyoming, Idaho, and Utah.

Melanotrichus tibialis (Van Duzee)

Fig. 154

Orthotylus tibialis Van Duzee, 1916:93.

Melanotrichus tibialis Knight, 1927:142.

This species was originally described from Fallen Leaf Lake, California, and has not been reported from elsewhere. New record from Nevada: 7 ♂ 10 ♀ July 11, 1965, alt. 6500 ft, above Carson City (H. H. Knight), taken on *Artemisia*.

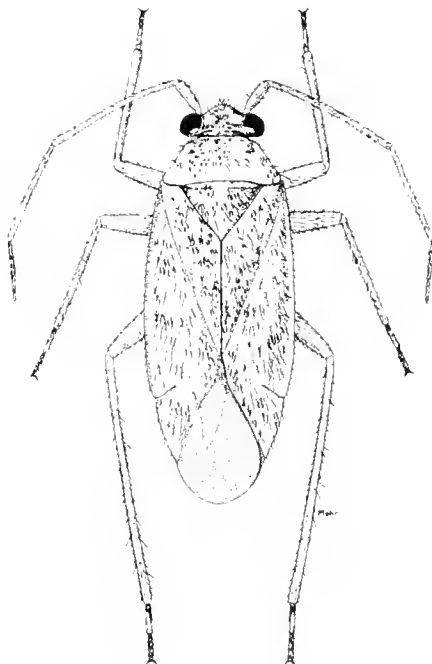


Fig. 153. *Melanotrichus ulthacae* (Hussey). ♀.

Melanotrichus ferox (Van Duzee)

Fig. 156

Orthotylus ferox Van Duzee, 1916:94.*Melanotrichus ferox* Knight, 1927:142.

This species was described from San Diego County, California, and should occur in southern Nevada. Records: 3♂ 2♀ Feb. 19, 1935, Whittier (E. L. Paddock), taken on *Artemisia californica*; 2♂ 3♀ July 31, 1915, Tulare County, California (E. L. Diven).

Melanotrichus inconspicuus (Uhler)

Fig. 157

Asciodema inconspicua Uhler, 1893:376.*Orthotylus inconspicuus* Reuter, 1909:69.*Melanotrichus inconspicuus* Knight, 1927:142.

This species was described from American Fork, Utah, and I have found it at Scipio, Utah, but not at the test site. Instead I found *M. nevadensis* filling the niche on *Artemisia tridentata*.

Melanotrichus atricornis Knight

Fig. 158

Melanotrichus atricornis Knight, 1927:145.

This species was described from British Columbia; not as yet recognized from elsewhere.

Melanotrichus nicholi Knight

Fig. 159

Melanotrichus nicholi Knight, 1927:145.

At present this species is known only from Arizona.

Melanotrichus incurvus Knight

Fig. 161

Melanotrichus incurvus Knight, 1927:143.

Known from Arizona, New Mexico, Colorado, Wyoming, and Iowa.

Melanotrichus chelifera Knight

Fig. 168

Melanotrichus chelifera Knight, 1927:144.

This species was described from Arizona, Colorado, and New Mexico, and now recorded from the Nevada Test Site: Area 19M, ♂ ♀ June 22, 1965.

Melanotrichus brevirostris Knight

Fig. 163

Melanotrichus brevirostris Knight, 1927:144.

This species was described from Utah, and as yet has not been found elsewhere.

Melanotrichus althaeae (Hussey)

Fig. 160

Orthotylus (Psallus) delicatus Cook, 1891:10.

Orthotylus althaeae Hussey, 1924:165, n. n. for *O. (Psallus) delicatus* Cook, preoc.

Melanotrichus althaeae Knight, 1927:142.*Melanotrichus althaeae* Knight, 1941:96, Fig. 127.

This species is known from Colorado, Michigan, Minnesota, and Iowa. Host plant is hollyhock, *Althaea rosea*.

Melanotrichus malvastri, new species

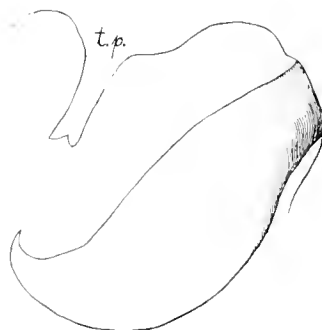
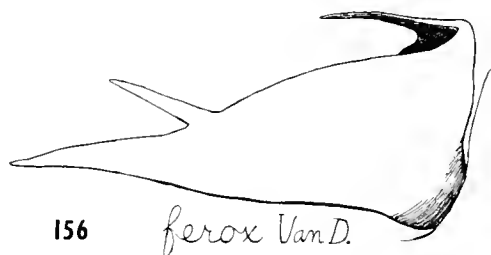
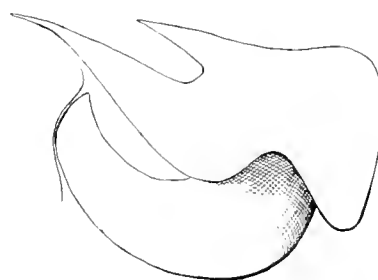
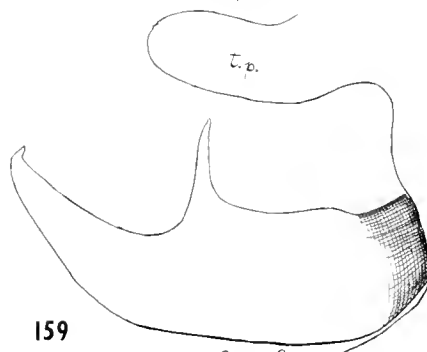
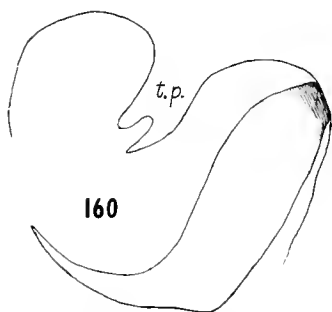
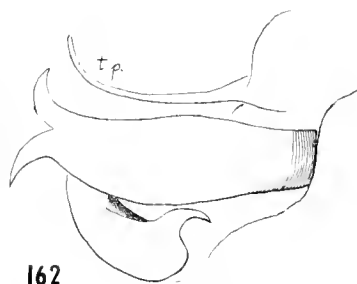
Fig. 162

Allied to *viridicatus* Uhler but distinguished by the furcate right clasper, and very long tergal process (Fig. 162).

Male. Length 3.4 mm, width 1.15 mm. Head: width .74 mm, vertex .34 mm. Rostrum, length .85 mm, reaching upon middle of hind coxae. Antennae: segment I, length .30 mm, pallid; II, 1.05 mm, cylindrical, slightly more slender on basal third, pale to yellowish, clothed with fine, short, pallid and fuscous pubescence; III, .71 mm; IV, .61 mm. Pronotum, length .51 mm, width at base 1.02 mm; disk nearly flat, calli convex, lateral margins sharply angled but not carinate. Dorsal surface clothed with suberect, yellowish bristles and intermixed with appressed, scalelike, deciduous black hairs; color green, more yellowish on head and scutellum. Hemelytra green, membrane strongly fuscous, veins white to green. Ventral surface and legs pallid to green. Genital segment and claspers distinctive, tergum with a very long, upturned process (Fig. 162).

Female. Length 3.5 mm, width 1.26 mm. Head: width .76 mm, vertex .37 mm. Antennae: segment I, length .30 mm; II, .95 mm; III, .58 mm; IV, .30 mm. Pronotum, length .51 mm, width at base 1.05 mm. Form, color and pubescence very similar to the male.

Holotype: ♂ April 2, 1936, Santiago Canyon, California (E. L. Paddock). **Allotype:** ♀ taken with the type. **Paratypes:** 3♂ 12♀ taken with the types on *Malvastrum fasciculatum*. 4♂

154 *tibialis* Van D.155 *viridicatus* Uhl156 *ferox* Van D.157 *inconspicuus* Uhl158 *atricornis* Kngt.159 *nicholi*160 *althaeae* Hussey161 *incurvus* Kngt.162 *malvastri*

Figs. 154-162. Male claspers. 154, *Melanotrichus tibialis* (Van D.); 155, *M. viridicatus* (Uhl.); 156, *M. ferox* (Van D.); 157, *M. inconspicuus* (Uhl.); 158, *M. atricornis* Kngt.; 159, *M. nicholi*; 160, *M. althaeae* (Hussey); 161, *M. incurvus* Kngt.; 162, *M. malvastri*.

4♀ April 18, 1935, Whittier, California (E. L. Paddock), taken on *Mahastrium fasciculatum*. 3♂ 4♀ April 16, 1928, alt. 2400 ft. Superior, Arizona (A. A. Nichol). ♂ 4♀ April 20, 1937, Florence, Arizona (L. L. Stitt).

Melanotrichus custeri, new species

Fig. 164

In the key this species runs in the couplet with *chelifer* Kngt., but may be distinguished by the right clasper, which has shorter bifurcate prongs and not curved upward (Fig. 164).

Male. Length 3.6 mm, width 1.15 mm. Head: width .70 mm, vertex .34 mm. Rostrum, length .78 mm, reaching to apex of middle coxae. Antennae: segment I, length .27 mm, greenish yellow, with black pubescent hairs; II, 1.05 mm, cylindrical, thickness equal to two-thirds that of segment I, greenish yellow, with black pubescence; III, .62 mm, yellowish; IV, .34 mm, dusky. Pronotum, length .52 mm, width at base 1.02 mm. Color deep blue green, but may turn yellowish green in old specimens. Dorsal surface clothed with deciduous, appressed, black scalelike hairs, intermixed with suberect pale hairs, and interspersed with more erect, pallid bristle hairs. Hemelytra blue green, membrane fuscous, veins green. Ventral surface paler, pale greenish to deep green. Legs pale greenish, femora darker and with black pubescence; tibial spines pallid to yellowish, tips of tarsi and the claws blackish. Male claspers distinctive, the bifurcate prongs on right clasper rather short and not curved upward (Fig. 164).

Female. Length 3.2 mm, width 1.2 mm. Head: width .74 mm, vertex .40 mm. Rostrum, length .85 mm, reaching to apices of middle coxae. Antennae: segment I, length .28 mm, pale, black pubescent, II, .85 mm, cylindrical, more slender on basal third, greenish yellow; III, .58 mm, yellowish; IV, .34 mm, dusky. Pronotum, length .54 mm, width at base .98 mm. Color and pubescence very similar to the male.

Holotype: ♂ Aug. 19, 1927, Custer, South Dakota (H. H. Knight). **Allotype:** ♀ taken with the type. **Paratypes:** ♂ 3 ♀ taken with the types. ♂ Aug. 1, 1927, Kendrick, Wyoming (H. H. Knight). ♂ ♀ June 29, 1965, Scipio, Utah (H. H. Knight).

Melanotrichus azteci, new species

Fig. 165

Allied to *incurtus* Kngt., but distinguished by the right clasper being sinuate on dorsal

margin, apical half tapering to an acuminate apex that curves upward (Fig. 165).

Male. Length 3.8 mm, width 1.3 mm. Head: width .74 mm, vertex .36 mm; vertex flat, bearing deciduous, black scalelike pubescence. Rostrum, length .96 mm, reaching to near apex of middle coxae, yellowish, apical half brownish black. Antennae: segment I, length .31 mm, yellowish, black pubescent, II, 1.1 mm, cylindrical, thickness equal to three-fourths that of segment I, greenish yellow, with fine black pubescence; III, .78 mm, dusky yellow; IV, .34 mm, dusky. Pronotum, length .58 mm, width at base 1.12 mm. Dorsal surface deep green, calli and head more yellowish green. Dorsum clothed with deciduous, appressed, black scalelike pubescence, intermixed with suberect, pallid simple hairs, and interspersed with longer bristlelike pallid hairs. Hemelytra with deep hypodermal green; membrane fuscous, paler on central area, a clear spot by apex of cuneus, veins green, cubitus fuscous. Ventral surface yellowish to green. Legs yellowish to green, femora and tibiae with short fuscous pubescence, tibial spines pallid. Genital claspers distinctive (Fig. 165).

Female. Length 3.7 mm, width .75 mm; costal margin moderately arcuate. Head: width .80 mm, vertex .41 mm. Rostrum, length .98 mm, reaching apex of middle coxae. Antennae: segment I, length .34 mm; II, 1.12 mm, cylindrical, more slender on basal half, yellowish green, with short black pubescent hairs; III, .70 mm, dusky yellow; IV, .31 mm, dusky. Pronotum, length .58 mm, width at base 1.2 mm. More robust than the male, but very similar in color and pubescence.

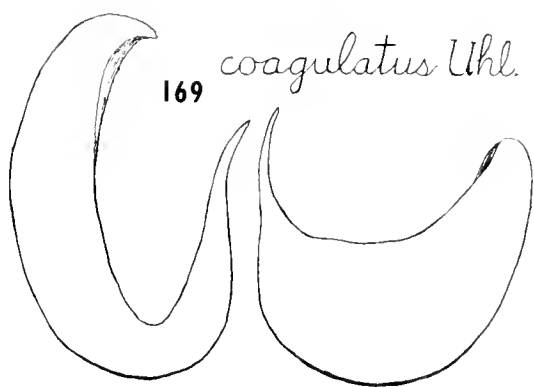
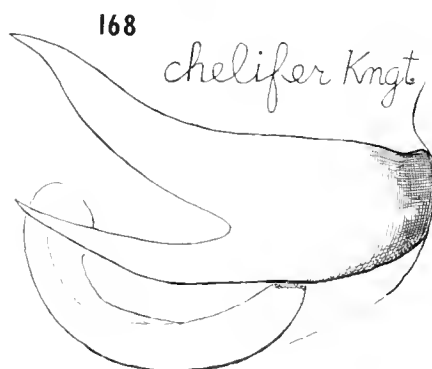
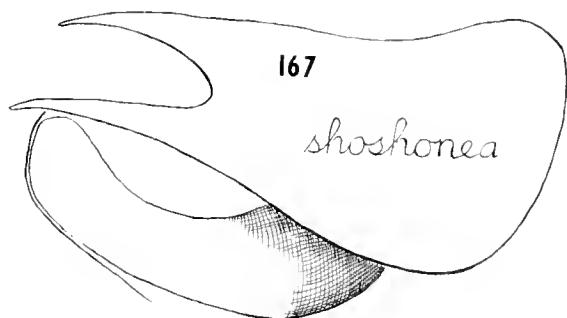
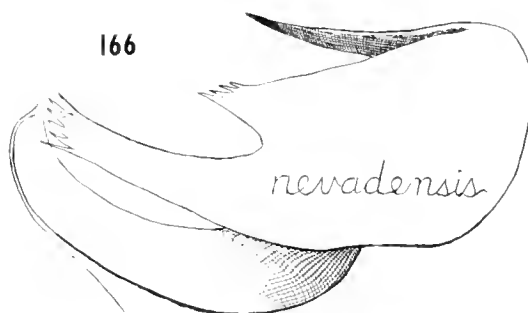
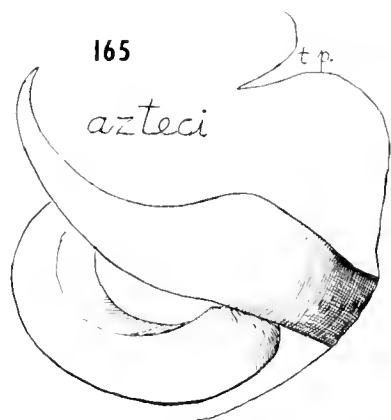
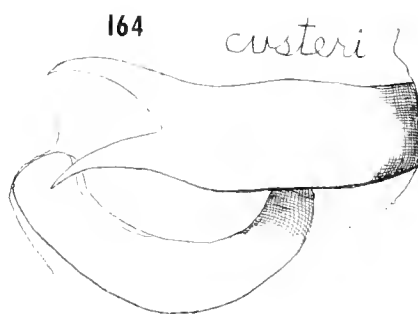
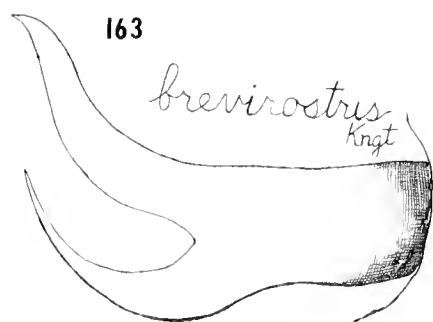
Holotype: ♂ Feb. 4, 1941, Aztec, Arizona (L. L. Stitt). **Allotype:** ♀ taken with the type. **Paratypes:** 2♂ 4♀ and nymphs taken with the types on *Sphaeralcea*. ♂ 3 ♀ Feb. 18, 1941, Mohawk; 8♀ Feb. 19, 1941, Sentinel; 9♀ March 17, 1939, Phoenix, Arizona (L. L. Stitt), all collected on *Sphaeralcea*.

Melanotrichus nevadensis, new species

Fig. 166

Allied to *inconspicuus* Uhler, but male claspers distinctive (Fig. 166); separated in the key by the uniformly green antennae.

Male. Length 3.4 mm, width 1.2 mm. Head: width .78 mm, vertex .40 mm. Rostrum, length .75 mm, reaching to apex of middle coxae, pallid, apex black. Antennae: segment I, length



Figs. 163-170. Male claspers. 163, *Melanotrichus brevirostris* Kngt.; 164, *M. custeri*; 165, *M. azteci*; 166, *M. nevadensis*; 167, *M. shoshonea*; 168, *M. chelifer* Kngt.; 169, *M. coagulatus* (Uhl.); 170, *M. albocostatus* (Van D.).

.34 mm, pallid, pubescence black; II, 1.2 mm, cylindrical, pallid to yellowish, pubescence pallid to black; III, .92 mm, dusky; IV, .34 mm, dusky. Pronotum, length .44 mm, width at base .96 mm. Color pallid, shaded, dotted and marked with blue green. Dorsal surface, especially the hemelytra clothed with appressed, deciduous, black scalelike pubescence, intermixed with suberect to erect black bristles, longer and more erect on head and pronotum. Hemelytra with costal margin slightly arcuate; membrane lightly and evenly shaded with pale fuscous, veins blue green. Ventral surface pallid, shaded with blue green. Legs pallid, femora and tibia shaded with green, tibial spines black. Genital claspers distinctive of the species (Fig. 166).

Female. Length 3.4 mm, width 1.36 mm. Head: width 1.15 mm, vertex .44 mm. Rostrum, length .92 mm, reaching to near apex of middle coxae. Antennae: segment I, length .30 mm, pallid; II, 1.05 mm, slender, thickness about half that of segment I, yellowish; III, .81 mm, dusky; IV, .34 mm, dusky. Pronotum, length .48 mm, width at base .96 mm. More robust than the male but very similar in color and pubescence.

Holotype: ♂ June 23, 1965, Area 19M, Nevada Test Site (H. H. Knight & J. M. Merino), taken on *Artemisia tridentata*. **Allotype:** ♀ same data as the type. **Paratypes:** 16♂ 25♀ taken with the types on *Artemisia tridentata*. 4♂ 8♀ June 11, Area 17M; ♂ ♀ June 11, Area 18M; 5♂ 6♀ June 22, Area 19M; 6♂ 14♀ June 19, 1965, Area 401M, Nevada Test Site (H. H. Knight & J. M. Merino), all taken on *Artemisia tridentata*, the host plant of the species.

Melanotrichus shoshonea, new species

Fig. 167

Allied to *inconspicuus* Uhler, and in the key these species run to the same couplet; distinguished by the bifid notch on apex of male right clasper (Fig. 167).

Male. Length 4.1 mm, width 1.3 mm. Head: width .80 mm, vertex .43 mm. Rostrum, length .85 mm, reaching to middle of intermediate coxae. Antennae: segment I, length .41 mm, black, sometimes only fuscous on dorsal surface; II, .46 mm, cylindrical, thickness about half that of segment I, black; III, 1.15 mm, brownish black; IV, .41 mm, blackish. Pronotum, length .50 mm, width at base .98 mm; disk nearly flat, calli outlined by impressed margins. Dorsal surface pale blue green; clothed with deciduous,

appressed, black scalelike pubescence, sparsely intermixed with suberect to erect, black bristlelike hairs. Hemelytra with costal margins slightly arcuate, embolium and outer margin of cuneus white; membrane pale fuscous, veins pallid to green. Ventral surface pallid to light blue green. Legs pallid, tibiae greenish, femora and tibiae with short fuscous pubescence, tibial spines black, tarsi fuscous to black. Genital claspers distinctive, right clasper bifid on apical fourth (Fig. 167).

Female. Length 3.4 mm, width 1.36 mm. Head: width .82 mm, vertex .47 mm; with long, erect black bristles on vertex and frons. Rostrum, length .85 mm, reaching to middle of intermediate coxae, pallid, apex black. Antennae: segment I, length .38 mm, black, more fuscous above; II, 1.22 mm, slender, thickness only half that of segment I, black, with short recumbent black pubescent hairs; III, .92 mm, brownish black; IV, .37 mm, blackish. Pronotum, length .50 mm, width at base .98 mm. More robust than the male, membrane shorter, but color and pubescence very similar.

Holotype: ♂ Aug. 14, 1927, Shoshone National Forest, Wyoming (H. H. Knight). **Allotype:** ♀ taken with the type. **Paratypes:** ♂ ♀ Aug. 7; 2♂ 4♀ Aug. 14, 1927, Shoshone National Forest (H. H. Knight), taken on *Artemisia*; 10♂ 11♀ Aug. 8, 1927, Yellowstone National Park, Wyoming (H. H. Knight), on *Artemisia*. ♂ June 14, 1930, alt. 4965 ft, St. Anthony, (R. E. Miller); ♂ July 7, 1928, Clayton, Idaho (C. Wakeland).

Melanotrichus coagulatus (Uhler)

Fig. 169

Macrocoleus coagulatus Uhler, 1877:417.

Orthotylus coagulatus Reuter, 1909:68.

Orthotylus (*Melanotrichus*) *coagulatus* Knight 1927:40, host.

Melanotrichus coagulatus Knight, 1927:142.

Records from the Nevada Test Site: Area M (Mereury), ♀ Aug. 15, 1965, at incandescent light; Area 1M, 88♂ ♀ July 16, 1965, at incandescent light; Area 5M, 3♂ Aug. 19, ♂ Aug. 28, 1965, at black light; Area 6M, ♂ July 19, 1965; Area 12M, ♂ June 11, 11♂ ♀ Aug. 11, 1965, on *Chenopodium leptophyllum*; 27♂ ♀ Aug. 6, 1965, taken on *Chenopodium fremonti*; 17♂ ♀ Aug. 7, 1965, taken on *Chenopodium leptophyllum*; 4♂ 4♀ Aug. 24, 1965, taken on *Chenopodium leptophyllum*; ♂ July 25, 1961, 5♂ July 25, 1962, at black light; 4♂ 2♀ Aug. 9, 1965, at black light; 4♂ 6♀ Aug. 6, 2♀ Aug.

7, ♀ Aug. 26, 1965; Area 16M, 23♂ ♀ June 11, ♂ Aug. 20, 1965; 2♂ 1♀ Aug. 11, 1965, taken on *Eriogonum deflexum*; Area 17M, 23♂ ♀ June 17, 8♂ ♀ Aug. 19, 1965, on *Chenopodium leptophyllum*; ♂ June 21, 1965; Area 18M, 2♂ 2♀ Aug. 23, 1965, on *Chenopodium leptophyllum*; 4♂ 1♀ July 22, 1965, at black light; Area 19M, ♂ ♀ June 23, 1965; Area 401M 10♂ ♀ June 23, 1965; Area TE, 2♂ 1♀ June 10, 1965; Area 12CF, ♀ Aug. 9, 1964, at incandescence light; Area 1B, 2♂ July 31, 1962, at black light; Area 6DC, ♂ May 20, 1961, from Berlese funnel; Area 1M, ♀ July 16, 1965, at incandescence light.

This species is commonly found in the western states of Colorado, Utah, Idaho, Wyoming, New Mexico, California, and Nevada.

Melanotrichus albocostatus (Van Duzee)

Fig. 170

Orthotylus albocostatus Van Duzee, 1918:299.

Melanotrichus albocostatus Knight, 1927:147.

Records from the Nevada Test Site: Area CM, 2♂ June 10, 1965; Area TE, 2♂ July 10, 1965; Area 17M, 2♂ June 17, 1965.

I have also identified this species from Arizona, British Columbia, Colorado, Idaho, Utah, and Washington.

Melanotrichus mistus (Knight)

Fig. 177

Orthotylus mistus Knight, 1925:91.

Melanotrichus mistus Knight, 1927:142.

This species was described from Alberta, Canada, but now I have identified specimens from Idaho and Washington.

Melanotrichus wileyae Knight

Fig. 171

Melanotrichus wileyae Knight, 1927:146.

This species is known only from Emery County, Utah.

Melanotrichus senectus (Van Duzee)

Orthotylus senectus Van Duzee, 1916:102.

Allied to *eurotiae* but separated by the shorter rostrum. Described from two females taken at Pueblo and Manitou, Colorado (E. P. Van Duzee). I have been unable to recognize this species among all the material examined.

Melanotrichus pallens, new species

Fig. 176

Keys out in the couplet with *wileyae*, but distinguished by shorter antennal segments, also by the golden yellow sericeous pubescence (Fig. 176).

Male. Length 4.6 mm, width 1.7 mm. Head: width .88 mm, vertex .41 mm; pallid. Rostrum, length 1.22 mm, reaching to base of hind coxae. Antennae: segment I, length .37 mm, pallid; II, 1.6 mm, cylindrical, pallid; III, 1.05 mm, dusky; IV, .34 mm. Pronotum, length .61 mm, width at base 1.36 mm. Dorsal surface uniformly pallid, clothed with golden yellow, appressed, sericeous pubescence, and intermixed with suberect, pale pubescent hairs and numerous longer, more erect bristle hairs. Hemelytra subtranslucent, membrane nearly clear, veins pallid, with opaque callus substance bordering cubitus about larger areole. Ventral surface and legs pallid, tips of tarsi fuscous. Genital segment and claspers distinctive (Fig. 176).

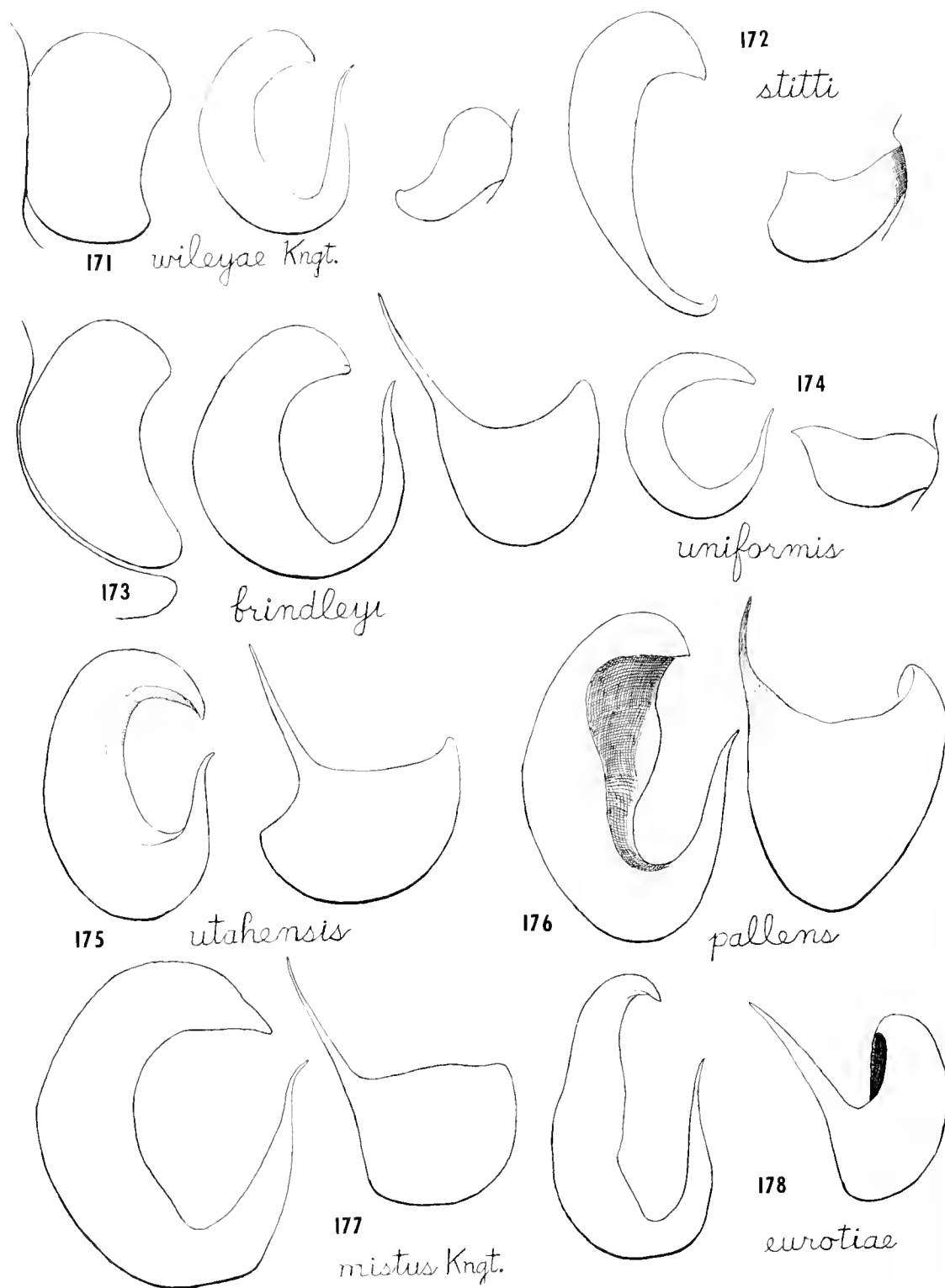
Female. Length 4.2 mm, width 1.9 mm. Head: width .95 mm, vertex .52 mm. Rostrum, length 1.36 mm, reaching apex of hind coxae, pallid, apex black. Antennae: segment I, length .34 mm, thickness .12 mm, pallid; II, 1.56 mm, slender, thickness just half that of segment I, pallid; III, 1.05 mm, dusky; IV, .30 mm, dusky. Pronotum, length .71 mm, width at base 1.49 mm. More robust than the male, but very similar in pubescence and pallid color.

Holotype: ♂ June 13, 1965, Area CM, Nevada Test Site (D. E. Beck, H. H. Knight & J. M. Merino). **Allotype:** ♀ same data as the type. **Paratypes:** 12♂ 7♀ taken with the types on *Chenopodium atrovirens*, found growing on the low ridges about 100 yards or more above Cane Springs. The pallid bugs were difficult to see on the pale colored *Chenopodium*, and in the leaf litter within the net. This species was not found elsewhere.

Melanotrichus atriplicis, new species

Runs in the key to the couplet with *brindleyi* from which it may be separated by the shorter rostrum, which only reaches upon hind coxae.

Female. Length 4.4 mm, width 1.7 mm. Head: width .95 mm, vertex .48 mm; yellowish. Rostrum, length 1.36 mm, reaching upon apex of hind coxae, yellowish, apex black. Antennae: segment I, length .37 mm; II, 1.39 mm, cylindrical, slender, thickness only half that of segment I, yellowish; III, 1.05 mm, dusky; IV, .41



Figs. 171-178. Male claspers. 171, *Melanotrichus wileyae* Kngt.; 172, *M. stitti*; 173, *M. brindleyi*; 174, *M. uniformis*; 175, *M. utahensis*; 176, *M. pallens*; 177, *M. mistus* Kngt.; 178, *M. eurotiae*.

mm, dusky. Pronotum, length .61 mm, width at base 1.36 mm. Dorsal surface pallid to greenish; sparsely clothed with recumbent, simple pale to yellowish pubescence, intermixed with more appressed, silvery, sericeous pubescence, also interspersed with erect, yellowish to golden brown bristle hairs. Ventral surface and legs pale yellowish; claws black, tibial spines golden yellow.

Holotype: ♀ June 24, 1965, Area 16M, Nevada Test Site (H. H. Knight & J. M. Merino), taken on *Atriplex canescens*. **Paratypes:** ♀ taken with the type. ♀ June 11, 1965, Area 16M; ♀ June 23, ♀ July 7, 1965, Area 18M; ♀ June 19, ♀ June 22, 1965, Area 401M, Nevada Test Site (D E. Beck, H. H. Knight & J. M. Merino); all specimens were taken from *Atriplex canescens* which I believe is the host plant.

Melanotrichus brindleyi, new species

Fig. 173

Runs in the key to couplet with *atriplicis* from which it may be separated by a longer rostrum that reaches beyond posterior coxae; male claspers distinctive (Fig. 173).

Male. Length 3.3 mm, width 1.2 mm. Head: width .75 mm, vertex .41 mm. Rostrum, length 1.46 mm, reaching behind posterior coxae, yellowish, apex black. Antennae: segment I, length .20 mm, pallid; II, .85 mm, cylindrical, thickness about equal to three-fourths thickness of segment I, pallid to yellowish; III, .58 mm, yellowish; IV, .34 mm. Pronotum, length .44 mm, width at base .98 mm. Color pallid to pale yellowish on head and scutellum. Dorsum clothed with sparsely set, appressed, silvery sericeous pubescence, intermixed with recumbent, simple pale to yellowish pubescence, and interspersed with more erect, yellowish to golden brown bristle hairs. Hemelytra with costal margins slightly arcuate, pallid; membrane pale milky to dusky, veins pallid. Ventral surface and legs pallid to pale yellowish; tibial spines pallid to yellowish. Male claspers distinctive (Fig. 173), left clasper forming a nearly closed capital "C"; right clasper with very slender, long apical process; spiculum projecting far above claspers.

Female. Length 3.4 mm, width 1.4 mm. Head: width .85 mm, vertex .47 mm. Rostrum, length 1.36 mm, reaching behind posterior coxae. Antennae: segment I, length .24 mm, pallid; II, .92 mm, cylindrical, more slender on basal half, thickness on apical half about two-thirds the

thickness of segment I, pallid, apical fourth dusky; III, .75 mm, dusky yellow; IV, .37 mm, dusky yellow. Pronotum, length .48 mm, width at base 1.05 mm. Dorsal aspect pale to yellowish, also tinged with greenish in the hypodermis. Dorsal surface clothed with appressed, silvery sericeous pubescence, intermixed with recumbent, pallid to yellowish simple pubescence, also interspersed with more erect, golden brown bristlelike hairs on corium. Hemelytra with costal margins arcuate, pallid to milky white; membrane nearly clear, veins pallid. Ventral surface pallid, tinged with greenish. Legs pallid like the male.

Holotype: ♂ Aug. 17, 1927, alt. 6500 ft. Big Horn Mts., Wyoming (H. H. Knight). **Allotype:** ♀ June 27, 1936, Moscow, Idaho (T. A. Brindley). **Paratypes:** 4♂ 3♀ taken with the holotype. ♀ June 27, 1936, taken with the allotype. ♀ Aug. 10, 1922, Cramer, Minnesota (H. H. Knight).

Melanotrichus utahensis, new species

Fig. 175

Runs in the key to near *stitti* and *uniformis*, but separated from these species by the shorter second antennal segment; also distinguished by structure of the male claspers (Fig. 175).

Male. Length 4.1 mm, width 1.5 mm. Head: width .82 mm, vertex .37 mm; greenish yellow. Rostrum, length .98 mm, reaching upon middle coxae, yellowish. Antennae: segment I, length .27 mm, yellowish; II, 1.12 mm, cylindrical, greenish yellow; III, .85 mm, yellowish; IV, .30 mm, dusky. Pronotum, length .58 mm, width at base 1.20 mm. Color pallid and shaded with green; dorsal surface clothed with appressed, silvery sericeous pubescence, intermixed with recumbent to suberect, golden brown hairs and numerous longer, erect bristle hairs. Hemelytra subtranslucent, tinted with small amounts of green in the hypodermis; membrane nearly clear, veins pallid. Ventral surface yellowish to green, mesosternum fuscous, venter green. Legs yellowish to greenish; tibiae unspotted, bearing pale to yellow bristles. Male claspers distinctive of the species (Fig. 175).

Female. Length 3.3 mm, width 1.3 mm. Head: width .64 mm, vertex .37 mm. Rostrum, length .85 mm, reaching upon middle coxae. Antennae: segment I, length .21 mm; II, .81 mm; III, broken. Pronotum, length .44 mm, width at base .95 mm. Color and pubescence very similar to the male.

Holotype: ♂ May 21, 1930, Richfield, Utah (E. W. Davis), taken at light trap. **Allotype:** ♀ taken with the type. **Paratypes:** 2♂ taken with the types. 2♂ July 15, 1930, Richfield, Utah (E. W. Davis), all taken at light trap.

Melanotrichus stitti, new species

Fig. 172

Allied to *uniformis*, runs to the same couplet in the key, but distinguished by the structure of the male genital claspers (Fig. 172).

Male. Length 3.5 mm, width 1.2 mm. Head: width .71 mm, vertex .37 mm. Rostrum, length .71 mm, reaching upon base of middle coxae. Antennae: segment I, length .26 mm, yellowish; II, 1.15 mm, cylindrical, greenish yellow; III, .85 mm, dusky yellow; IV, .30 mm, dusky. Pronotum, length .41 mm, width at base .98 mm, greenish yellow. Hemelytra pallid to yellowish; membrane pale, tinged with milky white, veins pallid, area about apices of areoles tinged dusky brown. Dorsal surface clothed with appressed, silvery, sericeous pubescence, and intermixed with simple, recumbent to suberect, golden brown hairs, also sparsely set with erect golden brown bristles. Ventral surface pale to yellowish and tinged with green. Tibial spines pallid, tips of tarsi fuscous, claws black. Genital claspers distinctive, apical part of left elasper tapered to more slender (Fig. 172).

Female. Length 2.5 mm, width 1.2 mm; embolar margins strongly arcuate. Head: width .78 mm, vertex .44 mm. Rostrum, length .71 mm, reaching to middle of hind coxae. Antennae: segment I, length .21 mm; II, .68 mm, cylindrical, slender, thickness only half that of segment I, yellowish; III, .56 mm, dusky yellow; IV, .30 mm, dusky. Pronotum, length .41 mm, width at base .98 mm. Hemelytra subtranslucent, tinged with green; membrane abbreviated, clear to pale white, veins pallid. Form shorter and more ovate, but color and pubescence very similar to the male.

Holotype: ♂ Feb. 5, 1941, Yuma, Arizona (L. L. Stitt). **Allotype:** ♀ taken with the type. **Paratypes:** 3♂ 2♀ taken with the types on *Atriplex polycarpa*, which Mr. Stitt gave as the host species. Named for the collector, Mr. Loyd L. Stitt who made valuable contributions to our knowledge of Arizona Miridae. Botanists at the test site report *Atriplex polycarpa* growing at the south edge of Frenchman Flat, so I expect this Mirid may eventually be found there.

Melanotrichus uniformis, new species

Fig. 174

Allied to *stitti* as both species run to the same couplet in the key, but size smaller, color green, membrane uniformly pale fuscous, and form of male claspers distinctive (Fig. 174).

Male. Length 3.3 mm, width 1.12 mm. Head: width .68 mm, vertex .31 mm; eyes prominent. Rostrum, length .75 mm, reaching upon base of middle coxae. Antennae: segment I, length .27 mm; II, 1.15 mm, cylindrical, thickness slightly more than half that of segment I, yellowish; III, .78 mm, yellowish; IV, .34 mm, yellowish. Pronotum, length .41 mm, width at base .88 mm. Color pale yellowish to green, hemelytra more green than elsewhere; membrane uniformly pale fuscous, veins pale. Dorsal surface clothed with appressed, silvery, sericeous pubescence, intermixed with recumbent, yellowish to golden simple hairs, and interspersed with more erect, golden bristle hairs. Ventral surface pale yellowish to greenish. Legs uniformly yellowish, tibial spines golden. Genital claspers distinctive (Fig. 174), the left elasper viewed from the posterior aspect, appearing like a nearly closed capital letter "C"; the right clasper compact, without a long slender apex found in related species.

Female. Length 3.4 mm, width 1.15 mm. Head: width .68 mm, vertex .39 mm; clypeus broad and prominent at base. Rostrum, length .88 mm, reaching near tips of middle coxae. Antennae: segment I, length .27 mm; II, .98 mm, slender, cylindrical, yellowish; III, .88 mm, dusky; IV, .34 mm, dusky. Pronotum, length .41 mm, width at base .92 mm. Color and pubescence very similar to the male.

Holotype: ♂ July 8, 1930, Richfield, Utah (E. W. Davis), taken in light trap. **Allotype:** ♀ taken with the type. **Paratypes:** ♂ July 8, taken with the types. ♀ July 15, 3♂ 9♀ Aug. 15, 1929, Richfield, Utah (E. W. Davis), taken in light trap. ♂ July 24, 1927, Kennebec, South Dakota (H. H. Knight).

Melanotrichus eurotiae, new species

Fig. 178

In the key this species runs in the couplet with *senectus* Van D., from which it may be separated by the longer rostrum.

Male. Length 4.4 mm, width 1.3 mm. Head: width .75 mm, vertex .34 mm; pallid to green, clypeus protruding strongly at base. Rostrum,

length 1.4 mm, reaching upon apex of hind coxae, or slightly beyond. Antennae: segment I, length .34 mm, pale to green; II, 1.36 mm, cylindrical, thickness more than half that of segment I, dusky yellow to greenish; III, .74 mm, dusky; IV, .30 mm, dusky. Pronotum, length .52 mm, width at base 1.1 mm. Color pallid, shaded, marked and spotted with blue green in hypodermis. Clothed with moderately thick, appressed, silvery sericeous pubescence, intermixed with pallid to yellowish suberect hairs, the corium bearing sparsely set, fuscous to black, erect bristle hairs. Hemelytra rather long, embolar margins nearly straight; membrane nearly clear, but with creamy to dusky shading, veins green. Ventral surface pallid to blue green. Legs pallid and shaded with green; tibiae dusky green, spines pallid to dusky depending on the angle of view. Male claspers distinctive

(Fig. 178); general form placing this species in the *coagulatus* Uhl. group.

Female. Length 3.8 mm, width 1.36 mm. Head: width .86 mm, vertex .44 mm. Rostrum, length 1.52 mm, reaching distinctly beyond apex of hind coxae. Antennae: segment I, length .30 mm, pallid; II, 1.05 mm, cylindrical, thickness about half that of segment I, pallid to greenish; III, .85 mm, dusky; IV, .30 mm, dusky. Pronotum, length .54 mm, width at base 1.16 mm. More robust than the male, but color and pubescence very similar.

Holotype: ♂ June 11, 1965, Area 16M, Nevada Test Site (D E. Beck, II, H. Knight & J. M. Merino). **Allotype:** ♀ same data as the type. **Paratypes:** 60 ♂ ♀ taken with the types on *Eurotia lanata*, which is the host plant of the species. 2 ♂ 11 ♀ June 17, 1965, Area 6M, Nevada Test Site, all taken on *Eurotia lanata*.

Genus *Parthenicus* Reuter

Key to the Sections

- 1. Membrane of hemelytra uniformly fuscous, at least more fuscous than dusky or pale, sometimes with white spots 2
Membrane clear, pallid or white, sometimes fumate or dusky brown, often with fuscous spots Section I, p. 129
- 2. Dorsum not uniformly colored, but distinctly spotted or flecked over a lighter or darker shade of ground color Section II, p. 142
Dorsum rather uniformly shaded or tinted, not distinctly spotted or flecked over a lighter ground color Section III, p. 152

Genus *Parthenicus* Reuter

Key to the Species, Section I

- 1. Membrane clear or white, usually distinctly spotted or marked with fuscous 2
Membrane rather evenly tinged with dusky or brownish, not distinctly spotted or marked with fuscous 26
- 2. Hemelytra uniformly greenish, cuneus red, veins marked with red; length (♀) 4.0 mm, (♂) 4.5 mm *cuncotinctus* Kngt.
Hemelytra colored otherwise 3
- 3. Vertex with a black spot each side just behind postero-dorsal angle of the eye 4
Vertex without spots 5
- 4. Membrane white, discal area devoid of spots; embolium with series of red spots; length 4.2 mm *davisi*, n. sp.
Membrane pallid, discal area and margins with several fuscous spots; embolium pallid, unspotted; length 3.4 mm *nigripunctus*, n. sp.

5. Second antennal segment with two black bands or annuli on basal half	6
Second antennal segment pallid, or with small dots or spots only	9
6. Veins in membrane red, or dotted with red	7
Veins in the membrane not red	8
7. Male right clasper with thumblike process at middle (Fig. 187); length 3.4 mm <i>accumulus</i> , n. sp.	
Male right clasper without process at middle (Fig. 184); length 3.1 mm <i>condensus</i> , n. sp.	
8. Male left clasper with apex flat, paddle-shaped (Fig. 181); length 4.0 mm <i>aridus</i> Kngt.	
Male left clasper with apex furcate (Fig. 183); length 3.8 mm <i>furcatus</i> , n. sp.	
9(5). Second antennal segment with distinct dots or spots	20
Second antennal segment pallid, without distinct spots, sometimes with an ob- scure dot near base	10
10. Discal area of membrane with several distinct fuscous spots	11
Discal area of membrane without fuscous spots	15
11. Rostrum reaching beyond posterior trochanters	14
Rostrum just reaching upon posterior trochanters	12
12. Dorsal surface with many reddish dots	13
Dorsal surface without reddish spots, but with a few setigerous fuscous dots; length 4.1 mm (Fig. 189) <i>trispinosus</i> , n. sp.	
13. Femora thickly dotted with reddish or reddish brown, tibiae with red dots at base of spines; length of antennal segment II (♀) exceeding width of pro- notum at base; length 3.4 mm <i>mundus</i> Van D.	
Femora pallid, without spots, tibiae unspotted; length of antennal segment II (♀) not equal to width of pronotum at base; length (♀) 2.6 mm <i>desertus</i> , n. sp.	
14. Hind femora thickly covered with fuscous dots; male right clasper with slender process near base (Fig. 188); length 3.1 mm <i>sabulosus</i> Van D.	
Hind femora with just a few fuscous dots near apex; male right clasper without process near base (Fig. 185); length 3.2 mm <i>merinoi</i> , n. sp.	
15. Length of antennal segment II not exceeding width of pronotum	16
Length of antennal segment II greater than width of pronotum	19
16. Spots in membrane not composed of clear cut fuscous dots	17
Spots in membrane, each composed of minute clear cut fuscous dots; length 2.8 mm <i>multipunctatus</i> , n. sp.	
17. Membrane with marginal fuscous spots	18
Membrane pallid, without fuscous spots; length 2.9 mm <i>atriplicis</i> , n. sp.	

18. Clavus and corium bearing only silvery sericeous pubescence except small spot on inner apical angle of corium; length 3.0 mm *deleticus*, n. sp.
Clavus and corium bearing both silvery and golden brown sericeous pubescence; length 2.7 mm *fuscipilus*, n. sp.
19. Tibial spines obscured by longer pilose hairs; length 3.4 mm *pilipes*, n. sp.
Tibial spines not obscured or confused by longer pilose hair; length 3.7 mm *conspersus*, n. sp.
- 20(9). Second antennal segment with 4 or 5 fuscous dots on basal half 21
Second antennal segment with not more than two dots on basal half 23
21. Dorsal surface with brown or fuscous colored dots only 22
Dorsal surface sprinkled with numerous orange colored dots; length 2.6 mm *mincopunctatus*, n. sp.
22. Male right clasper tapering and curving to an upturned acuminate apex; length 3.0 mm *candidus* Van D.
Male right clasper with a straight, chitinized edge on dorsal margin just before apex; length 2.7 mm *nicholi* Kngt.
23. Tibial spines obscured by longer pilose hairs; length 3.4 mm *pilipes*, n. sp.
Tibial spines not obscured by longer pilose hairs 24
24. Larger areole with not more than one fuscous spot 25
Larger areole with 4 or 5 fuscous spots; length 3.7 mm *tenuis*, n. sp.
25. With red dots and spots on embolium, cuneus and veins; length 2.7 mm *rubrosignatus*, n. sp.
Without red dots on corium, cuneus and veins; membrane white, with two marginal fuscous spots each side; length 3.4 mm *selectus*, n. sp.
- 26(1). Length of antennal segment II greater than width of pronotum at base 28
Length of antennal segment II not exceeding width of pronotum at base 27
27. Length of antennal segment II only slightly less than width of pronotum at base; dorsal surface with numerous red flecks and dots; tibiae with strong red dots at base of spines; length 2.7 mm *pinicola*, n. sp.
Length of antennal segment II plus dorsal width of an eye, subequal to width of pronotum at base; dorsal surface without distinct red dots; tibiae with faint fuscous dots at base of spines dots stronger on front tibiae; length 3.0 mm *brevicornis*, n. sp.
28. Width of vertex distinctly greater than dorsal width of an eye 29
Width of male vertex subequal to dorsal width of an eye; length 3.8 mm *soror* Van D.
29. Ventral margin of lorum bright red; male right clasper furcate on apical third (Fig. 203); length 4.1 mm *brindleyi*, n. sp.
Ventral margin of lorum not red; male right clasper slender on apical half, not furcate; length 4.0 mm *grex* Van D.

Parthenicus davisi, new species

Fig. 180

Allied to *nigripunctus*, but distinguished by the unspotted white membrane, also by structure of the male claspers (Fig. 180).

Male. Length 4.1 mm, width 1.3 mm. Head: width .61 mm, vertex .34 mm; pallid, a black spot just behind dorsal margin of the eye. Rostrum, length 1.4 mm, reaching upon eighth ventral segment. Antennae: segment I, length .30 mm, pallid, a transverse black spot on dorsal surface just beyond middle; II, 1.1 mm, pallid, with black annulus near base, and with an incomplete black annulus on middle; III, .88 mm, pallid; IV, .30 mm, yellowish. Pronotum, length .44 mm, width at base 1.02 mm; pallid, about 12 black dots on disk, anterior angles fuscous. Scutellum pallid, mesonotum fuscous. Hemelytra pallid, sparsely dotted with fuscous, also with fuscous spots; membrane white, with two or three marginal, pale fuscous spots; veins white, but with three or four brownish dots. Dorsal surface clothed with recumbent to sub-

erect, simple white pubescent hairs, intermixed with appressed, silvery, sericeous pubescence; inner apical margin of corium, and two spots on inner margin of cuneus, with golden brown to black scalelike hairs. Ventral surface pallid, mesosternum fuscous. Legs pallid, femora with a few black dots on apical half, posterior pair with a larger, subapical black spot. Tibial bristles pallid, but with a series of black spots on dorsal surface. Venter pallid, sides marked with reddish dots and flecks; genital claspers distinctive of the species (Fig. 180).

Holotype: ♂ July 8, 1930, Richfield, Utah (E. W. Davis), taken in light trap. **Paratype:** ♂ taken with the type. The species is named in honor of the collector, Mr. E. W. Davis.

Parthenicus nigripunctus, new species

Fig. 182

Runs in the couplet with *davisi* but may be distinguished by having several fuscous spots on discal area of membrane.

Male. Length 3.4 mm, width 1.3 mm. Head: width .59 mm, vertex .34 mm; pallid, having a black spot behind dorsal margin of the eye. Rostrum, length 1.3 mm, reaching to seventh or eighth ventral segments. Antennae: segment I, length .30 mm, pallid, with a transverse dorsal black mark just beyond middle; II, 1.0 mm, pallid, a black annulus near base, and a black spot on dorsal surface near middle; III, .61 mm, pallid; IV, .34 mm, pallid. Pronotum, length .40 mm, width at base 1.0 mm, pallid, a few fuscous points about calli; basal margin of disk with four small spots bearing erect, black scalelike hairs. Scutellum pallid, mesonotum with several fuscous dots. Hemelytra milky white, corium with three or four small points which bear a group of black scalelike hairs; cuneus with several brownish and fuscous dots. Membrane and veins white, with three marginal fuscous spots plus several others scattered over discal area. Dorsal surface clothed with recumbent to suberect, simple pallid hairs, and intermixed with appressed, silvery, sericeous pubescence; the corium with four or five points bearing a group of erect, black scalelike hairs. Ventral surface pallid, mesosternum and two spots on genital segment fuscous. Genital claspers distinctive of the species (Fig. 182).

Holotype: ♂ June 20, 1965, Area CT, Nevada Test Site (H. H. Knight & J. M. Merino), taken at light. **Paratype:** ♂ Aug. 23, 1965, Area M (Mercury) Nevada Test Site (J. M. Merino), taken at laboratory light.

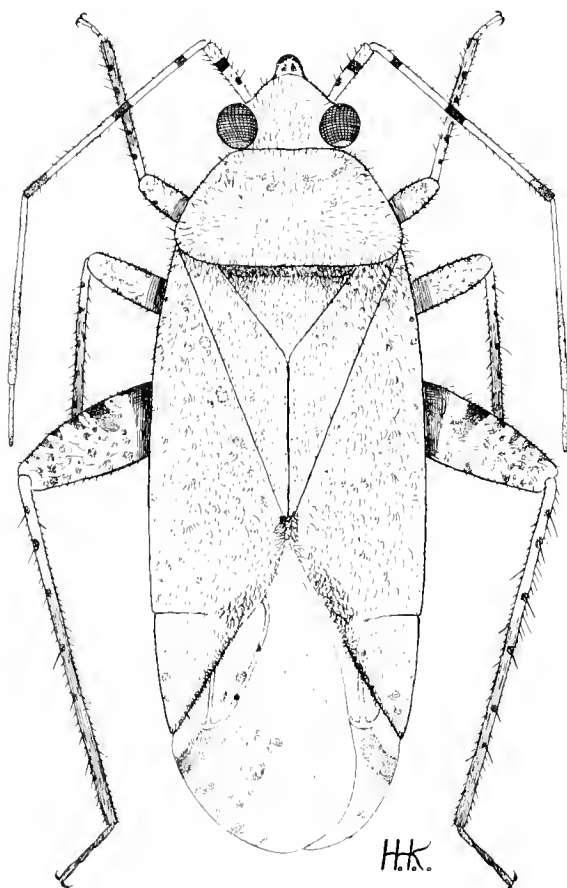


Fig. 179. *Parthenicus aridus*, ♂.

Parthenicus accumululus, new species

Fig. 187

This species runs in the key to the couplet with *condensus* from which it may be separated by structure of the male claspers (Fig. 187).

Male. Length 3.5 mm, width 1.12 mm. Head: width .61 mm, vertex .32 mm; pallid and marked with fuscous. Rostrum, length 1.2 mm, reaching upon sixth ventral segment. Antennae: segment I, length .28 mm, reaching upon sixth ventral segment. Antennae: segment I, length .28 mm, pallid, with a transverse dorsal black spot at slightly beyond middle; II, 1.0 mm, pallid, apical half greenish, a black band near base, and a dorsal black mark near middle; III, .74 mm, pallid to dusky; IV, broken. Pronotum, length .37 mm, width at base .88 mm; pallid, calli and many spots on disk, black. Mesonotum fuscous, scutellum pallid, with 4 or 5 fuscous spots. Dorsal surface clothed with recumbent to suberect, pale simple pubescent hairs and intermixed with appressed, silvery, sericeous pubescence; a few golden brown sericeous hairs on inner apical angles of corium and along inner edge of cuneus. Hemelytra pallid, corium shaded with fuscous, embolium and cuneus flecked and marked with hypodermal red, inner edge of cuneus and inner apical angle of corium edged with red; membrane whitish, flaked and dotted with fuscous spots, a larger spot just beyond apex of cuneus, veins red. Ventral surface pallid to fuscous, mesosternum nearly black. Legs pallid, femora and tibiae with numerous black dots and spots, spines pallid. Venter pallid to fuscous, a darker lateral line is visible, also flecked with hypodermal red; genital claspers are distinctive of the species (Fig. 187).

Holotype: ♂ July 16, 1965, Area 1M, Nevada Test Site (D E. Beck & J. M. Merino), taken at incandescent light trap. **Paratype:** ♂ taken with the type.

Parthenicus condensus, new species

Fig. 184

Runs in the key to the couplet with *accumulus* from which the males are easily distinguished by the genital claspers (Fig. 184).

Male. Length 3.1 mm, width 1.08 mm. Head: width .61 mm, vertex .37 mm; pallid and marked with fuscous, clypeus with Y-shaped white mark, frons strongly convex, sides fuscous, leaving median line pale. Rostrum, length 1.36 mm, reaching beyond hind coxae or to middle of venter. Antennae: segment I, length

.34 mm, pallid, dorsal surface with a transverse black spot slightly beyond middle; II, 1.15 mm, pallid, dorsal surface with black spot near base and a larger black spot just short of middle, apex broadly fuscous; III, .74 mm, pale to fuscous; IV, missing. Pronotum, length .44 mm, width at base .92 mm, disk fuscous to black, paler on median line and before calli. Mesoscutum and scutellum pallid, shaded and dotted with fuscous. Pubescence on dorsal surface largely lost, but from remnants we may say, clothed with suberect pale simple hairs, and intermixed with appressed, silvery, sericeous pubescence, also some golden brown sericeous hairs on corium. Hemelytra pallid to white, shaded with fuscous and marked with blackish dots and spots; cuneus white, marked with flakes and dots of hypodermal red. Membrane white, marked with several fuscous spots which are larger on margin beyond apex of cuneus; veins red. Ventral surface pallid and shaded with fuscous, darker on mesosternum. Legs white, marked with black dots and a few larger spots; tibiae with prominent black dots but the spines are pallid. Genital segment fuscous, claspers distinctive (Fig. 184).

The genital segment of the type was removed for study and illustration, but has been mounted on the same point with water soluble glue, leaving the claspers visible for inspection.

Holotype: ♂ Aug. 8, 1965, Area 17M, Nevada Test Site (J. M. Merino), taken at black light.

Parthenicus furcatus, new species

Fig. 183

This species is closely related to *aridus* Kngt., but may be separated by structure of the male claspers (Fig. 183).

Male. Length 3.6 mm, width 1.4 mm. Head: width .64 mm, vertex .37 mm, pallid, each side of frons marked with transverse fuscous lines, sides of clypeus fuscous. Rostrum, length 1.46 mm, reaching upon middle of venter. Antennae: segment I, length .37 mm, white, with a transverse black band on apical half, also with two setigerous black dots on basal half; II, 1.15 mm, white, a black band at middle, also an incomplete band near base, apex infuscated; III, .95 mm, pallid to dusky; IV, .46 mm, dusky. Pronotum, length .51 mm, width at base 1.12 mm; disk pallid, with fuscous dots, calli fuscous. Scutellum pallid, mesonotum fuscous. Dorsal surface clothed with recumbent and suberect, pale simple hairs, and intermixed with ap-

pressed, silvery, sericeous pubescence, and spots of golden brown to black scalelike hairs on corium and inner margin of cuneus. Hemelytra white, sparsely marked with fuscous dots and spots; cuneus with a few flecks of hypodermal red. Membrane white, marked with numerous irregular spots and dots of fuscous, a large fuscous spot just behind apex of cuneus; veins white. Ventral surface pallid and shaded with fuscous. Legs pallid to white, femora marked with numerous large and small fuscous dots and spots, even on basal half of posterior femora; tibiae with double row of black spots, but spines are pallid. Venter pallid and marked with fuscous; genital claspers of remarkable form, distinctive of the species (Fig. 183).

Holotype: ♂ July 16, 1965, Area 1M, Nevada Test Site (D. E. Beck & J. M. Merino), taken at incandescent light. **Paratypes:** 5♂ taken with the type.

Parthenicus trispinosus, new species
Fig. 189

Runs in the key to the couplet with *mundus* Van D., from which it differs by absence of red dots on dorsal surface and in structure of the male claspers (Fig. 189).

Male. Length 4.0 mm, width 1.4 mm. Head: width .61 mm, vertex .30 mm. Rostrum, length 1.19 mm, reaching upon posterior trochanters. Antennae: segment I, length .27 mm, pallid; II, 1.09 mm, pallid; III, .71 mm, pallid; IV, .34 mm, pale. Pronotum, length .48 mm, width at base 1.12 mm; disk pallid, anterior angles pale fuscous. Mesoscutum fuscous, scutellum pallid, basal half pale fuscous. Hemelytra pallid, subtranslucent, setigerous punctures visible but scarcely shaded. Membrane pale milky white, sparsely marked with fuscous spots, a larger marginal spot just beyond tip of cuneus, also one just before apex of membrane; veins pallid. Dorsal surface clothed with recumbent and suberect pale pubescent hairs, intermixed with appressed pale to silvery and golden sericeous pubescence; inner apical angle of corium and two spots along inner margin of cuneus, bearing golden brown scalelike hairs. Ventral surface pallid, mesosternum fuscous. Legs pallid, femora with numerous fuscous dots and spots, the posterior pair more thickly and strongly marked; tibiae pallid, spines pale, brownish dots barely visible at base of some spines. Venter pale, a fuscous lateral line visible, also with fine flecks and dots of reddish. Genital segment and claspers distinctive (Fig. 189).

Holotype: ♂ June 24, 1965, Area 19M Nevada Test Site (H. H. Knight & J. M. Merino), taken on *Chrysothamnus viscidiflorus*.

Parthenicus aridus Knight
Figs. 179, 181

Parthenicus aridus Knight, 1919:113 (1918).

This species was described from New Mexico, but is closely related to desert species of Nevada.

Parthenicus mundus Van Duzee
Fig. 190

Parthenicus mundus Van Duzee, 1923:155.

Described from Santa Cruz Island, California, where it was taken on *Atriplex*.

Parthenicus sabulosus Van Duzee
Fig. 188

Parthenicus sabulosus, Van Duzee, 1925:401.

This species was described from Utah, and specimens are now known from Arizona and the Nevada Test Site: Area 401M, ♀ June 20, 1965.

Parthenicus desertus, new species

In the key this species runs in the couplet with *mundus* Van D., but may be distinguished by the unspotted legs; and length of second antennal segment not equal to width of pronotum at base.

Female. Length 2.6 mm, width 1.0 mm. Head: width .56 mm, vertex .30 mm; pale yellowish. Rostrum, length 1.02 mm, reaching upon posterior trochanters. Antennae: segment I, length .20 mm, pale yellowish; II, .82 mm, cylindrical, more slender than segment I, pale yellowish; III, .51 mm, pale; IV, .23 mm, dusky. Pronotum, length .40 mm, width at base .86 mm; pallid, calli more yellowish; lateral margins and anterior angles with erect, simple, pale to golden hairs. Scutellum yellowish. Hemelytra pallid, sparsely marked with a few reddish flecks. Membrane pale to clear, marked with several large fuscous spots; veins pallid, with a few small reddish flecks. Dorsal surface sparsely clothed with recumbent to suberect, pale to golden simple pubescent hairs, intermixed with appressed, pale to golden sericeous pubescence, more golden brown in tufts at inner apical angles of corium, and on inner margin of cuneus. Ventral surface pale yellowish. Legs uniformly

pallid, a few dusky dots on apical half of femora; tibiae pallid, no setigerous dots visible.

Holotype: ♀ Aug. 7, 1964, Area CB, Nevada Test Site (D E. Beck), taken at black light.

Parthenicus merinoi, new species

Fig. 185

Runs in the key to couplet with *sabulosus* Van D. from which it may be separated by the sparsely dotted femora and the structure of the male genital claspers (Fig. 185).

Male. Length 3.2 mm, width 1.2 mm. Head: width .62 mm, vertex .36 mm; yellow. Rostrum, length 1.3 mm, reaching upon eighth ventral segment. Antennae: segment I, length .30 mm, pallid, with a setigerous fuscous dot on apical half; II, broken. Pronotum, length .44 mm, width at base 1.0 mm; pale yellowish, anterior angles and calli pale fuscous. Scutellum and mesoscutum pale to yellowish. Hemelytra pallid but with a few odd fuscous dots; embolium and cuneus with just a few red flecks; membrane white, discal area and margins with fuscous dots and spots, a large half crescent shaped marginal spot just beyond apex of cuneus. Dorsal surface clothed with recumbent and suberect pallid simple hairs, and intermixed with appressed, silvery, sericeous pubescence, more golden at apex of corium and along inner margin of cuneus. Ventral surface pallid, mesosternum infuscated. Legs pallid, front femora with fuscous dots, larger spots beneath; hind femora with only a few small dots on apical third; tibial spines pallid, front tibiae with four large black dots, but spots on hind tibiae nearly obsolete. Venter pallid to yellowish; genital claspers distinctive of the species (Fig. 185).

Holotype: ♂ July 20, 1965, Area 5M, Nevada Test Site (D E. Beck & J. M. Merino), taken at incandescent light. **Paratypes:** ♂ collected with the type. 2♂ July 19, 1965, Area 5M Nevada Test Site (D E. Beck & J. M. Merino), taken with black-light trap.

Parthenicus multipunctatus, new species

Fig. 198

Distinguished from all members of the genus by having minute fuscous dots grouped to form larger spots; structure of male claspers distinctive (Fig. 198), not closely related to any known species.

Male. Length 2.6 mm, width 1.15 mm. Head: width .54 mm, vertex .30 mm; pallid. Rostrum, length 1.02 mm, reaching to near base

of genital segment. Antennae: segment I, length .27 mm, pallid; II, .88 mm, pallid, with two fuscous dots, one near base, the other a bit short of middle; III, .64 mm, yellowish; IV, .34 mm, yellowish. Pronotum, length .40 mm, width at base 1.02 mm, pallid, yellowish on calli. Scutellum pallid, fuscous on base at middle; mesonotum yellowish. Dorsal surface clothed with simple, pale recumbent and several suberect longer hairs, intermixed with more appressed, silvery sericeous pubescence, a few golden sericeous hairs on cuneus. Hemelytra white, sparsely sprinkled with fuscous dots and spots, cuneus included. Membrane white, sparsely marked with groups of minute fuscous dots, one group in larger areole, and microdots on veins. Ventral surface pallid. Legs nearly white, a few fine fuscous dots on apical half of femora; front tibiae with weak fuscous dots, hind tibiae impunctate, clothed with a few long pilose hairs which are longer than the true spines. Male claspers distinctive of the species (Fig. 198).

Holotype: ♂ June 30, 1965, St. George, Utah (H. H. Knight), taken while sweeping vegetation.

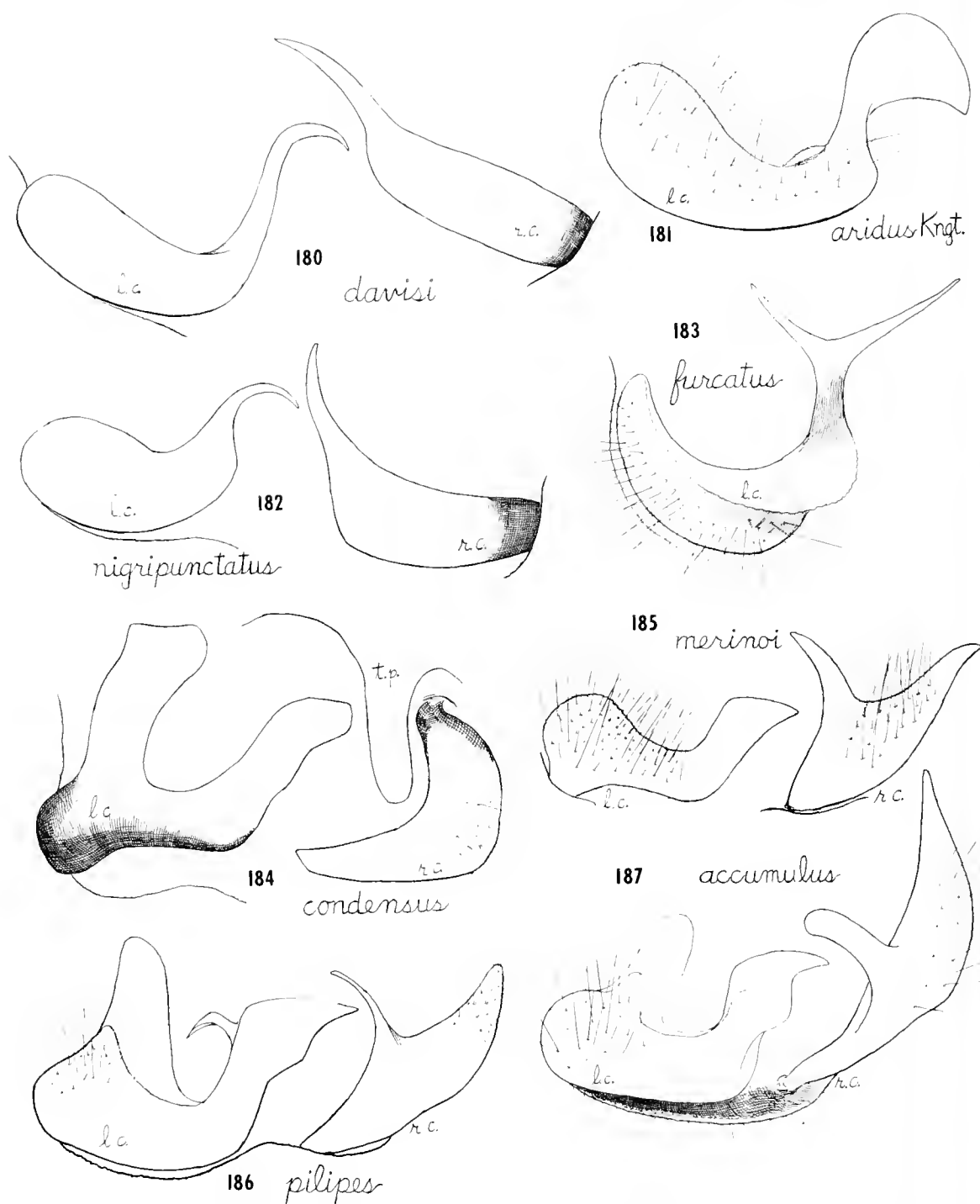
Parthenicus atriplicis, new species

Fig. 195

Runs in the key to the couplet with *fuscipilus*, but differs from that and other species by the pallid color, unspotted membrane, and by golden sericeous pubescence on middle and apex of corium; male claspers distinctive of the species (Fig. 195).

Male. Length 2.9 mm, width 1.02 mm. Head: width .52 mm, vertex .28 mm; pallid. Rostrum, length .95 mm, reaching upon posterior trochanters. Antennae: segment I, length .20 mm, pallid; II, .78 mm, pallid; III, .40 mm, pallid; IV, shriveled. Pronotum, length .40 mm, width at base .85 mm. Scutellum pale yellowish, bearing both silvery and golden sericeous pubescence. Hemelytra uniformly white; membrane milky white, veins pale. Dorsal surface clothed with recumbent to suberect, simple white pubescent hairs, intermixed with appressed, silvery and golden sericeous pubescence; golden pubescence concentrated on apical fourth of corium, across middle of clavus and upon corium, also a few golden hairs on apical half of the cuneus. Ventral surface and legs pallid; femora and tibiae without spots.

Female. Length 2.4 mm, width .88 mm. Head: width .54 mm, vertex .30 mm; pallid to yellowish. Rostrum, length .98 mm, reaching



Figs. 180-187. Male claspers. 180, *Parthenicus davisii*; 181, *P. aridus*, left; 182, *P. nigripunctatus*; 183, *P. furcatus*, left; 184, *P. condensus*; 185, *P. merinoi*; 186, *P. pilipes*; 187, *P. accumulatus*.

slightly beyond trochanters to near base of ovipositor. Antennae: segment I, length .17 mm; II, .64 mm, pallid; III, broken. Pronotum, length .72 mm, width at base .81 mm. Slightly more robust than the male but very similar in color and pubescence.

Holotype: ♂ July 21, 1965, Area 401M Nevada Test Site (D E. Beck & J. M. Merino), taken at black light. **Allotype:** ♀ same data as the type. **Paratypes:** 3♂ 2♀ taken with the types. Others from the Nevada Test Site: Area CM, 2♂ 4♀ June 13, 1965, taken on *Atriplex*

canescens: Area 16M, ♂ 4 ♀ June 11, 1965, taken on *Atriplex*; Area CFM, ♀ Aug. 28, 1965, taken on *Atriplex canescens*; Area 401M ♀ June 22, 1965, (H. H. Knight & J. M. Merino), taken on *Atriplex canescens*.

Parthenicus deleticus, new species

Fig. 192

Runs in the key to the couplet with *fuscipilus*, but differs in having only silvery sericeous pubescence on clavus and corium; also distinguished by structure of the male claspers (Fig. 192).

Male. Length 3.0 mm, width 1.0 mm. Head: width .55 mm, vertex .27 mm; yellowish. Rostrum, length 1.02 mm, reaching upon base of posterior trochanters. Antennae: segment I, length .21 mm, pallid, a fuscous mark at slightly beyond middle; II, .82 mm, yellowish; III, .61 mm, dusky yellow; IV, broken. Pronotum, length .37 mm, width at base .85 mm, yellowish. Scutellum pallid. Dorsal surface clothed with recumbent to suberect, pale simple hairs, and intermixed with appressed, silvery sericeous pubescence; base of pronotum with golden brown sericeous hairs, also inner apical margin of corium, and inner margin of cuneus with a few golden brown hairs. Hemelytra pallid to white, without dots or spots; membrane milky white, with fuscous brown spot behind apex of cuneus and a marginal brown spot near apex; veins white. Ventral surface pallid, mesosternum fuscous. Legs pallid, femora with fuscous spots; hind femora thickly marked with large and small fuscous spots; tibiae with fuscous dots, nearly obsolete on posterior pair. Venter pallid; genital segment and claspers distinctive of the species (Fig. 192).

Holotype: ♂ June 27, 1924, Tucson, Arizona (A. A. Nichol), taken at light.

Parthenicus fuscipilus, new species

Fig. 191

Runs in the key to the couplet with *atriplicis* but distinguished by large marginal fuscous spots in the membrane and in structure of the male claspers (Fig. 191).

Male. Length 2.7 mm, width 1.1 mm. Head: width .54 mm, vertex .27 mm; pallid. Rostrum, length 1.02 mm, reaching upon posterior trochanters. Antennae: segment I, length .23 mm, pallid; II, .82 mm, pallid; III, .44 mm, dusky yellow; IV, .27 mm, dusky. Pronotum, length .38 mm, width at base .85 mm; pallid to yellowish, calli infuscated. Scutellum yellowish, basal

half pale fuscous. Hemelytra pallid to yellowish, subtranslucent; membrane pale to milky white, veins pale, with four rather large marginal fuscous spots. Dorsal surface clothed with simple recumbent and suberect pubescent hairs, intermixed with appressed, silvery sericeous pubescence, also with golden brown scalelike hairs on scutellum, inner apical angles of corium, inner margin and discal area of cuneus. Ventral surface pale to fuscous, mesosternum blackish. Legs pallid, femora with fuscous spots, front pair with transverse spots; hind femora with numerous fuscous dots and spots, darker above, pallid beneath. Tibiae pallid, spines pale to dusky, with fuscous spots at base of spines. Venter pale to fuscous; claspers distinctive of the species (Fig. 191).

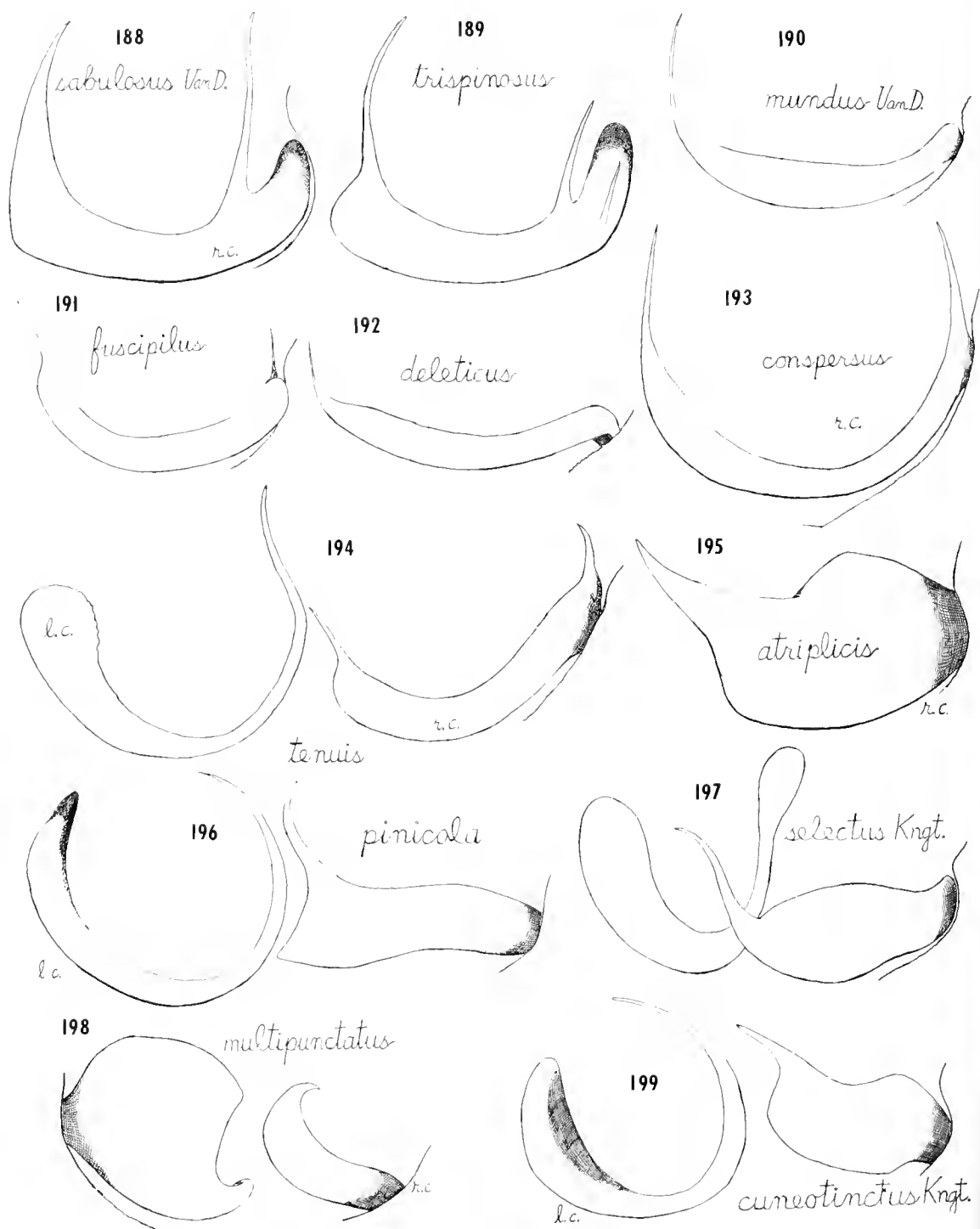
Holotype: ♂ July 16, 1917, Post Creek Canyon, Bonita, Arizona (H. H. Knight), taken at light trap.

Parthenicus pilipes, new species

Fig. 186

Runs in the key to the couplet with *conspersus* but differs in having long pilose hairs on tibiae that obscure the true spines; male claspers distinctive of the species (Fig. 186).

Male. Length 3.4 mm, width 1.1 mm. Head: width .64 mm, vertex .36 mm. Rostrum, length 1.3 mm, reaching upon genital segment, yellow. Antennae: segment I, length .30 mm, yellowish, a black dot above on apical half; II, 1.1 mm, pale yellowish, with one or two fuscous to black dots on basal half; III, .68 mm; IV, .30 mm. Pronotum, length .40 mm, width at base .98 mm; pale to yellowish. Scutellum yellowish. Dorsal surface clothed with recumbent to suberect simple pale hairs, and intermixed with appressed, silvery, sericeous pubescence; with a few golden sericeous hairs along inner margin of cuneus. Hemelytra pallid to yellowish, without spots or flecks of color; cuneus yellow to orange yellow on apical half, also with a few golden sericeous hairs. Membrane pale whitish, apical half with small pale fuscous spots, discal area free of distinct spots; veins a strong yellow. Ventral surface yellow, mesosternum fuscous. Legs pale to yellow, coxae strongly yellow; front femora with a few fuscous spots on apical half; hind femora with numerous microdots on sub-apical area; front tibiae with black dots, also on posterior tibiae but dots smaller, pallid, clothed with numerous pilose hairs which obscure or become confused with true spines. Genital segment and claspers distinctive (Fig. 186).



Figs. 188-199. Male claspers. 188, *Parthenicus sabulosus* Van D., right; 189, *P. trispinosus*, right; 190, *P. mundus* Van D., right; 191, *P. fuscipilus*, right; 192, *P. deleticus*, right; 193, *P. conspersus*, right; 194, *P. tenuis*; 195, *P. atriplicis*, right; 196, *P. pinicola*; 197, *P. selectus* Kngt.; 198, *P. mutipunctatus*; 199, *P. cuneotinctus* Kngt.

Holotype: ♂ May 16, 1961, Area MD (Mercury), Nevada Test Site (D. E. Beck), taken at light. **Paratype:** ♂ July 20, 1962, Area JA, Nevada Test Site, taken at black light.

Parthenicus conspersus, new species

Fig. 193

Runs in the key to the couplet with *pilipes* from which it may be separated by lack of long pilose hairs on tibiae; also distinguished by structure of the male claspers (Fig. 193).

Male. Length 3.7 mm, width 1.36 mm. Head: width .62 mm, vertex .27 mm; yellowish, ventral half of lorum and apex of jugum, red. Rostrum, length 1.22 mm, reaching upon posterior trochanters. Antennae: segment I, length .30 mm, pallid, a large setigerous mark on dorsal aspect just beyond middle; II, 1.19 mm, pallid to dusky, a narrow incomplete fuscous annulus at base; III, .82 mm, dusky; IV, .34 mm, dusky. Pronotum, length .47 mm, width at base .95 mm; pale yellowish, disk sprinkled with red flecks, margins of calli with red. Scutellum pallid, median line at base reddish, bearing a few golden brown hairs. Dorsal surface clothed with recumbent to suberect, simple pale hairs and intermixed with both appressed, silvery sericeous pubescence and golden brown hairs; the golden brown hairs form a thick spot just behind apex of clavus, and smaller tufts along inner margin of cuneus and paracuneus. Hemelytra pallid, sparsely dotted with reddish flecks, also with red flecks on veins about areoles. Membrane and veins whitish, with two marginal fuscous spots, also smaller spots between and on discal area. Ventral surface pallid and marked with reddish. Legs pallid, femora with numerous red spots and dots, hind femora with fuscous brown dots and spots; tibiae with red dots, spines pallid. Venter more red than pale; male claspers distinctive of the species (Fig. 193).

Female. Length 3.1 mm, width 1.36 mm. Head: width .62 mm, vertex .36 mm. Antennae: segment I, length .27 mm, pallid, with reddish mark just beyond middle; II, .98 mm, pallid to dusky, scarcely darker at base; III, .72 mm; IV, .32 mm. Pronotum, length .44 mm, width at base .95 mm. Slightly shorter and more robust than the male but very similar in color and pubescence.

Holotype: ♂ Aug. 15, 1929, Richfield, Utah (E. W. Davis), taken at light. **Allotype:** ♀ taken with the type. **Paratypes:** 7♂ 2♀ taken with

the types. 5♂ 3♀ July 8, 1930, Richfield, Utah (E. W. Davis).

Parthenicus miniopunctatus, new species

Separated from related species by having five fuscous dots on basal half of second antennal segment; dorsal surface sprinkled with small reddish dots.

Female. Length 2.6 mm, width 1.0 mm. Head: width .66 mm, vertex .30 mm; pale yellowish. Rostrum, length 1.2 mm, reaching to base of ovipositor. Antennae: segment I, length .20 mm, pallid, one spot on apical half; II, .78 mm, pallid, with five reddish brown dots on dorsal aspect of basal half; III, .48 mm, pale; IV, broken. Pronotum, length .38 mm, width at base .78 mm; disk pale yellowish, with a few red flecks. Scutellum pale yellowish, with a few reddish flecks; mesonotum orange pink. Hemelytra pallid to white, sprinkled with small round reddish brown dots. Membrane milky white, veins white; with two very weak submarginal fuscous spots. Dorsal surface clothed with recumbent to suberect, simple pale pubescent hairs, intermixed with appressed, silvery and golden sericeous pubescence; a small patch of thicker golden brown scalelike hair on inner apical angle of corium; also with more golden than silvery hairs on middle of corium and cuneus. Ventral surface pale to yellowish, mesosternum scarcely darker. Legs pale to yellowish, hind femora with a few small dots of orange brown; also with weak reddish brown dots on tibiae, spines pallid.

Holotype: ♀ Aug. 8, 1965, Area 17M, Nevada Test Site (J. M. Merino), taken at black light.

Parthenicus tenuis, new species

Fig. 194

May be separated from allied species by having fuscous spots within larger areole and on veins; distinguished by structure of the male claspers (Fig. 194).

Male. Length 3.7 mm, width 1.2 mm. Head: width .58 mm, vertex .27 mm; pale and marked with reddish. Rostrum, length 1.19 mm, reaching upon middle of venter. Antennae: segment I, length .27 mm, pale to dusky; II, .95 mm, pale to dusky, without marks; III, .58 mm, dusky; IV, .28 mm. Pronotum, length .44 mm, width at base .95 mm; pale to dusky, calli and anterior angles infuscated, disk showing several reddish dots. Scutellum fuscous, apex paler; mesonotum infuscated. Hemelytra pallid to dusky, clavus

pale fuscous bordering scutellum; clavus, corium and cuneus sprinkled with small reddish dots. Membrane pale milky white, marginal area behind cuneus, darkened by a fuscous cloud, discal area and within larger areole, marked with fuscous dots and spots. Dorsal surface clothed with recumbent to suberect pale pubescent hairs, intermixed with appressed, golden sericeous pubescence; also with some silvery sericeous pubescence on scutellum, base of clavus, and a sparsely set transverse band across apex of clavus and on corium to reach the embolium; golden pubescence more abundant on cuneus, especially along inner margin, and a thick patch on inner apical angle of corium. Ventral surface infuscated, more strongly on mesosternum. Legs pallid, thickly dotted and marked with reddish brown, more heavily and thickly on hind femora from base to apex; tibiae with red spots at base of pallid spines. Venter pallid to fuscous; genital claspers distinctive of the species (Fig. 194).

Holotype: ♂ Aug. 15, 1929, Richfield, Utah (E. W. Davis), taken at light trap. **Paratypes:** 2♂ July 8, 1930, Richfield, Utah (E. W. Davis) at light. ♂ Oct. 6, 1914, Promontory, Utah (A. Wetmore). ♂ June 19, 1965, Area 401M, Nevada Test Site (H. H. Knight & J. M. Merino), swept from *Juniperus osteosperma*, which may well be the host plant.

Parthenicus rubrosignatus, new species

Runs in the key to the couplet with *selectus* Kngt., but may be separated by the red dots on embolium, cuneus and veins in the membrane.

Female. Length 2.7 mm, width 1.3 mm. Head: width .61 mm, vertex .37 mm; pallid and marked with dusky shading. Rostrum, length 1.36 mm, reaching beyond base of ovipositor. Antennae: segment I, length .27 mm, pallid; II, 1.1 mm, pallid; III, .58 mm, dusky; IV, broken. Pronotum, length .44 mm, width at base .98 mm; disk pallid, anterior angles bearing some golden brown scalelike hairs. Scutellum and mesonotum pallid to dusky, thickly clothed with golden brown sericeous pubescence. Hemelytra pallid to dusky; embolium and cuneus with strong reddish orange dots and spots. Membrane white, apical half with pale fuscous marginal spots; veins white, marked with reddish dots. Dorsal surface clothed with recumbent and suberect, pale simple pubescence, thickly intermixed with appressed, golden brown, sericeous pubescence; pronotum and middle of corium

with some patches of silvery sericeous pubescence. Ventral surface pallid to fuscous. Legs pallid, femora dusky, front pair with small reddish dots; hind femora shaded with fuscous, apical half with brown spots, ventral surface with reddish orange dots; tibial spines with golden shine, tibial spots orange red.

Holotype: ♀ June 10, 1965, Area TE, Nevada Test Site (D. E. Beck, H. H. Knight & J. M. Merino).

Parthenicus pinicola, new species
Fig. 196

Runs in the key to near *soror* Van D., but may be separated by the shorter second antennal segment which in length does not exceed width of pronotum at base; distinguished by structure of the male claspers (Fig. 196).

Male. Length 2.7 mm, width 1.0 mm. Head: width .54 mm, vertex .23 mm, yellowish. Rostrum, length 1.12 mm, reaching upon base of genital segment. Antennae: segment I, length .15 mm, reddish; II, .82 mm, yellowish; III, .51 mm, dusky yellow; IV, .27 mm, dusky. Pronotum, length .40 mm, width at base .85 mm; disk pallid, sprinkled with red dots. Scutellum pale, sprinkled with red dots. Hemelytra pallid, rather thickly sprinkled with hypodermal red dots and spots; membrane fumate, unspotted; veins pallid to reddish. Dorsal surface clothed with recumbent to suberect, simple pale golden yellow hairs, intermixed with appressed, moderately abundant silvery to golden sericeous pubescence; a few golden brown hairs along inner margin of cuneus. Ventral surface pallid and marked with reddish. Legs pallid, femora rather thickly dotted and marked with red spots; tibiae with bright red spots at base of golden yellow spines.

Female. Length 2.4 mm, width 1.1 mm. Head: width .58 mm, vertex .30 mm. Antennae: segment I, length .17 mm; II, .78 mm; III, .44 mm; IV, .24 mm. Pronotum, length .37 mm, width at base .85 mm. Color and pubescence very similar to that of the male.

Holotype: ♂ Aug. 13, 1925, Durango, Colorado (H. H. Knight), taken on *Pinus edulis*. **Allotype:** ♀ taken with the type. **Paratypes:** 6♀ July 24, 1900, Salida (E. D. Ball), and 6♀ Aug. 14, 1925, Mesa Verde National Park, Colorado (H. H. Knight). 5♂ 5♀ Aug. 3, 1917, 40 mi S of Grand View, Grand Canyon, Arizona (H. H. Knight), taken on *Pinus*. 3♀ Aug. 25, 1965, Area 12M, Nevada Test Site (J. M. Merino), taken on *Pinus monophylla*.

Parthenicus brevicornis, new species

Runs in the key to the couplet with *pinicola*, from which it differs by the shorter second antennal segment and by lack of red dots on dorsum.

Male. Length 3.0 mm, width .95 mm. Head: width .54 mm, vertex .24 mm; pallid, eyes reddish brown. Rostrum, length 1.0 mm, reaching to middle of venter. Antennae: segment I, length .17 mm, pallid; II, .74 mm, cylindrical, pallid; III, .44 mm, pale; IV, .20 mm, dusky. Pronotum, length .44 mm, width at base .88 mm, lateral margins of disk with a few long, erect pale hairs. Scutellum pallid, with four or five reddish brown spots on basal half, after pubescence is rubbed off. Hemelytra white, inner apical angle of corium narrowly reddish brown, apical half with a few faintly reddish dots; cuneus tinged brownish on basal half. Membrane pale dusky, veins pallid, tinged with reddish about smaller areole. Dorsal surface sparsely clothed with simple, pallid, recumbent hairs, more thickly intermixed with appressed sericeous, silvery and a few golden hairs; inner apical margin of corium, and two spots on inner margin of cuneus with golden brown pubescence; basal half of scutellum with a few sericeous, golden brown hairs. Ventral surface and legs pallid; tibiae with weak fuscous dots.

Holotype: ♂ July 21, 1962, Area CE, Nevada Test Site (D E. Beck), taken at black light. **Paratype:** ♀ July 25, 1965, Area 401M, Nevada Test Site (D E. Beck & J. M. Merino), taken on *Gutierrezia microcephala*.

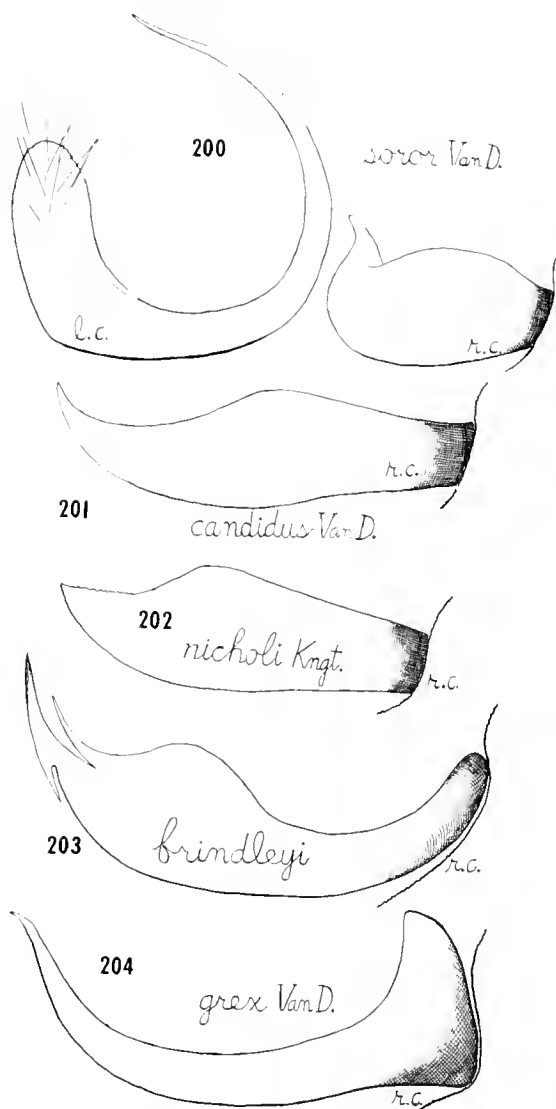
Parthenicus brindleyi, new species

Fig. 203

Runs in the key to the couplet with *grex* Van Duzee, from which it may be separated by the red lorum; distinguished by structure of male claspers (Fig. 203).

Male. Length 4.1 mm, width 1.36 mm. Head: width .61 mm, vertex .34 mm; pale to yellowish, ventral half of lorum red. Rostrum, length 1.56 mm, reaching close to base of genital segment. Antennae: segment I, length .35 mm, pallid; II, 1.46 mm, pallid; III, 1.0 mm, pale yellowish; IV, .47 mm, yellowish. Pronotum, length .51 mm, width at base 1.05 mm, pale to yellowish; propleura and anterior angles pale fuscous, disk sprinkled with fine red dots. Scutellum yellowish, with red flakes and dots. Hemelytra pallid, sprinkled and marked with red dots and spots, cuneus and veins closely

dotted with red. Membrane pale to dusky, marginal spot behind cuneus and apical area shaded with fuscous; veins white, marked with red. Dorsal surface clothed with recumbent to sub-erect, simple pale to golden yellow hairs, intermixed with more appressed, silvery and golden yellow, sericeous pubescence; inner margin of cuneus with a few golden brown sericeous hairs, but most of the pubescence has been rubbed off before mounting. Ventral surface pallid and shaded with reddish. Legs pallid, femora dotted with red on apical half, hind pair more heavily marked; tibiae pallid, spines and hairs golden yellow, with small red dots at base of spines on basal half. Genital segment and



Figs. 200-204. Male claspers. 200, *Parthenicus soror* Van D.; 201, *P. candidus* Van D., right; 202, *P. nicholi* Kngt., right; 203, *P. brindleyi*, right; 204, *P. grex* Van D., right.

claspers very distinctive of the species (Fig. 203).

Female. Length 3.4 mm, width 1.0 mm. Head: width .62 mm, vertex .37 mm. Rostrum, length 1.53 mm, reaching to base of ovipositor. Antennae: segment I, length .34 mm; II, 1.46 mm, pallid. Pronotum, length .47 mm, width at base 1.02 mm. Color and pubescence very similar to the male.

Holotype: ♂ Sept. 5, 1932, Moscow Mt., Moscow, Idaho (T. A. Brindley). **Allotype:** ♀ Sept. 4, 1932, alt. 300 ft Moscow Mt., Moscow, Idaho (W. E. Shull). **Paratypes:** 3♂ Sept. 4, 1932, alt. 3000 ft, type locality (H. Cline).

Named in honor of Dr. T. A. Brindley who collected the type specimen, and in past years sent me various species of Miridae from his collecting in Idaho.

Parthenicus cuncotinctus Knight
Fig. 199

Parthenicus cuncotinctus Knight, 1925:129.

This species was described from a specimen taken Aug. 19, 1924, Sierrita Mts., Arizona, and unreported elsewhere up to now. Records from Utah: 3♂ Aug. 15, 1929; ♂ July 8, 1930, Richfield (E. W. Davis), taken at light trap. Records from the Nevada Test Site: Area 5M, ♀ Aug. 4, 1965, on *Atriplex confertifolia*; Area 16M, 2♂ June 24, 1965; Area 17M, ♀ Aug. 8, at black light; 4♂ Aug. 25, 1965, on *Atriplex canescens*; Area 401M, 9♂ 4♀ June 20, 5♂ 6♀ June 22, 1965, taken on *Atriplex canescens*.

Parthenicus selectus Knight
Fig. 197

Parthenicus selectus Knight, 1925:121.
Described from Arizona.

Parthenicus candidus Van Duzee
Fig. 201

Parthenicus candidus Van Duzee, 1918:300.
This species is known only from southern California.

Parthenicus nicholi Knight
Fig. 202

Parthenicus nicholi Knight, 1925:120.
Described from the Santa Catalina Mts., Arizona, where Mr. Nichol found it breeding on *Hyptis emoryi*. Closely related to *candidus* Van D., but careful drawings from paratypes show that the male claspers are different (Fig. 202).

Parthenicus soror Van Duzee
Fig. 200

Psallus soror Van Duzee, 1917:280.
Parthenicus soror Van Duzee, 1918:302.

This species was described from Stockton, California, and I now have specimens from Richfield, Utah (E. W. Davis).

Parthenicus grex Van Duzee
Fig. 204

Parthenicus grex Van Duzee, 1925:403.
Described from Stockton, California. The drawing of the male clasper is from a paratype.

Genus *Parthenicus* Reuter
Key to the Species, Section II

- 1. Membrane uniformly fuscous, unspotted 3
- Membrane fuscous, but distinctly irrorate with large and small pale spots 2
- 2. Membrane fuscous, but irrorate with numerous pale spots: length 3.6 mm
 *irroratus* Kngt.
- Membrane fuscous, but with a large marginal pale spot each side and one on apex: length 3.4 mm *muchmorei*, n. sp.
- 3. Antennal segment I pallid to yellowish, dorsal aspect with a strong setigerous red spot on apical half; length 3.2 mm *ruber* Van D.
- Antennal segment I without a strong red spot on apical half 4
- 4. Antennal segment I brownish black, femora likewise: length 3.5 mm.
 *basicornis*, n. sp.
- Antennal segment I and the femora not brownish black 5

5. Length of first antennal segment not equal to width of vertex 6
 Length of male antennal segment I equal to or slightly exceeding width of vertex; dorsal surface rather uniformly sprinkled with reddish dots and spots; veins about areoles white, but marked with red dots; length 3.7 mm
 *brunneus* Van D.
6. Clavus pallid or pale, sometimes with a few scattered red dots 7
 Clavus red on base, sometimes by a concentration of red dots 13
7. Veins in membrane with red, at least red around smaller areole 10
 Veins in membrane not red, not having more than 3 or 4 red dots 8
8. Antennae long, length of segment II exceeding width of pronotum plus width of head; length 4.1 mm *femoratus* Van D.
 Antennal segment II in length, subequal to width of pronotum 9
9. Rostrum just reaching to apex of hind coxae; length 3.6 mm . *nicholollus*, n. sp.
 Rostrum reaching behind coxae or to middle of the venter; length 2.5 mm
 *fuscus*, n. sp.
10. Clavus with red spots or flecks 11
 Clavus white, unspotted; length 3.3 mm *nevadensis*, n. sp.
11. Hemelytra white, bearing silvery sericeous pubescence, with golden pubescence only at inner apical angle of corium; length 3.4 mm *utahensis*, n. sp.
 Hemelytra pallid, bearing silvery and golden sericeous pubescence, intermixed on clavus and corium 12
12. Femora and tibia with red dots; claspers distinctive (Fig. 209); length 2.5 mm
 *rubropunctipes*, n. sp.
 Femora with fuscous dots and fuscous shading; claspers distinctive (Fig. 210); length 2.7 mm *obsoletus*, n. sp.
- 13(6). Clavus with red on base, paler across middle 14
 Clavus not strongly red on base, not paler across middle 16
14. Front and middle femora pallid or green; length 2.6 mm *pictus* Kngt.
 Front and middle femora dotted with red, similar to the hind femora 15
15. Rostrum reaching upon hind coxae; male right clasper broad, with a short point apically (Fig. 222); length 3.4 mm *oreades* Kngt.
 Rostrum reaching beyond hind coxae; male right clasper more slender, with a long projecting sharp point at posterior dorsal angle (Fig. 212); length 3.2 mm *cercocarpis*, n. sp.
16. Length of second antennal segment not exceeding width of pronotum 17
 Length of second antennal segment greater than width of pronotum; femora chiefly red, hind pair irrorate with pale spots on dorsal surface; length 3.4 mm *pallidicollis* Van D.

17. Rostrum reaching beyond posterior trochanters 18
 Rostrum just reaching upon posterior trochanters; length 3.5 mm
 *cowaniae*, n. sp.
18. Hind femora chiefly red, with red flakes and spots of red 20
 Hind femora chiefly fuscous, with fuscous spots above and reddish brown beneath 19
19. Femora shaded and dotted with fuscous to black; male right clasper distinctive (Fig. 219); length 2.7 mm *becki*, n. sp.
 Femora marked and shaded with red; male right clasper distinctive (Fig. 216); length 3.3 mm *ribcsi*, n. sp.
20. Male right clasper distinctive (Fig. 223), having terminal prong curved mesad; length 2.6 mm *incurvus*, n. sp.
 Male right clasper (Fig. 215) with terminal prong curved dorsad; length 2.9 mm *rufiguttatus*, n. sp.

Parthenicus muchmorei, new species

Allied to *irroratus* Kngt. but distinguished by having only four large pale spots in the membrane.

Female. Length 3.4 mm, width 1.3 mm. Head: width .58 mm, vertex .32 mm; yellowish and marked with red. Rostrum, buried in glue but it apparently reaches upon hind coxae. Antennae: segment I, length .27 mm, pallid, with transverse reddish mark just beyond middle; II, 1.1 mm, pallid, with reddish spot near base; III, buried in glue. Pronotum, length .44 mm, width at base .98 mm; disk pallid, with several large and small red spots, anterior margin solid red. Scutellum pale to dusky, marked with red spots. Hemelytra with costal margins moderately arcuate; pallid, dotted and sprinkled with red flecks and spots, a larger patch of red on apex of corium and tip of cuneus; embolium, radial and claval veins with linear series of red dots. Membrane fuscous, discal area, apex, and marginal spot each side pale; veins red. Dorsal surface clothed with recumbent and suberect pale simple hairs, and thickly intermixed with appressed, silvery and golden brown sericeous pubescence; a thick spot of golden brown to black scalelike hairs behind tip of clavus, and smaller spots of golden brown hairs on inner margin of cuneus. Ventral surface pallid and shaded with fuscous and red. Legs pallid, femora thickly spotted and dotted with red; hind femora darker and more heavily marked with reddish spots and marks. Tibiae white, bearing

long pallid spines, and with prominent red spots at base of each.

Holotype. ♀ May 29, 1931, Camp Baldy, California (L. L. Muchmore), taken at light. Named for the collector who years ago sent specimens for identification.

Parthenicus basicornis, new species

Fig. 208

Distinguished from related species by the brownish black first antennal segment, and by structure of the male claspers (Fig. 208).

Male. Length 3.5 mm, width 1.2 mm. Head: width .68 mm, vertex .30 mm; fuscous to reddish brown. Rostrum, length 1.42 mm, reaching to middle of venter. Antennae: segment I, length .24 mm, brownish black; II, 1.30 mm, pale fuscous; III, broken. Pronotum, length .44 mm, width at base .92 mm; fuscous. Scutellum pale fuscous. Hemelytra pallid to dusky, or very pale fuscous. Membrane and veins uniformly pale dusky brown. Dorsal surface clothed with recumbent to suberect pale to yellowish simple hairs, intermixed with appressed, silvery sericeous pubescence. Ventral surface pale dusky brown to fuscous. Legs pale dusky brown, femora darker, near brownish black; tibiae pallid to dusky, impunctate. Genital segment and claspers distinctive of the species (Fig. 208).

Holotype: ♂ July 15, 1929, Richfield, Utah (E. W. Davis), taken in light trap.

Parthenicus nicholellus, new species

Fig. 206

Runs in the key to the couplet with *fuscus* from which it may be separated by the shorter rostrum; distinguished by structure of the male claspers (Fig. 206).

Male. Length 3.6 mm, width 1.15 mm. Head: Head: width .66 mm, vertex .23 mm; pallid. Rostrum, length 1.05 mm, reaching upon apex of hind coxae. Antennae: segment I, length .24 mm, pale to dusky; II, 1.10 mm, pale to yellowish; III, .68 mm, dusky yellow; IV, .31 mm, dusky. Pronotum, length .47 mm, width at base 1.05 mm; disk pale, with a few brownish flecks and dots. Scutellum pale, fuscous on basal half. Hemelytra pallid, sprinkled with dots and flecks of reddish brown; membrane uniformly dusky brown, veins dusky, pallid about smaller areole. Dorsal surface clothed with recumbent to sub-erect pale to yellowish simple hairs, intermixed with appressed, silvery and golden sericeous pubescence, more golden brown behind apex of elavus and along inner edge of cuneus. Ventral surface pallid to brownish, darker on meso-sternum. Legs pallid, tinged with dusky brown, darker on hind femora; femora dotted and marked with brown and orange brown; tibiae more pallid, spines pallid, and having weak brownish dots at base. Genital claspers distinctive of the species (Fig. 206).

Female. Length 3.1 mm, width 1.2 mm. Head: width 1.15 mm, vertex .34 mm. Rostrum reaching upon posterior trochanters. Antennae: segment I, length .22 mm, pale fuscous; II, .88 mm, pale to dusky brown; III, .62 mm, dusky; IV, .35 mm, dusky. Pronotum, length .40 mm, width at base .95 mm. Very similar to the male in color and pubescence.

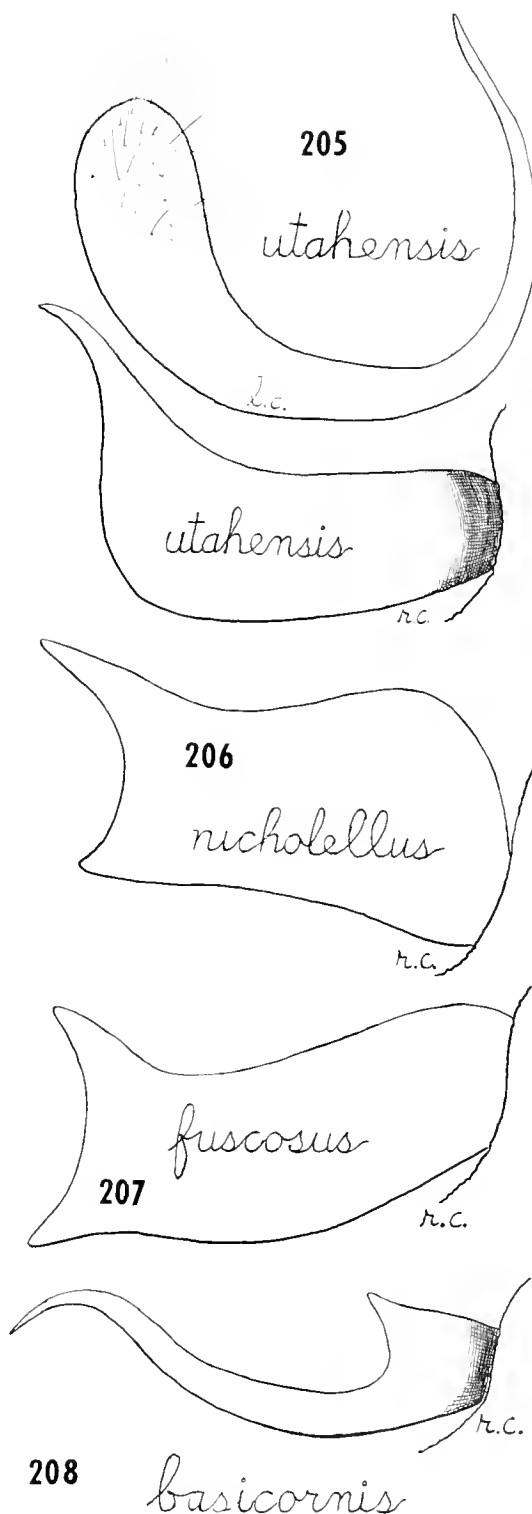
Holotype: ♂ April 19, 1926, alt. 2400 ft, Tucson, Arizona (A. A. Nichol). **Allotype:** ♀ same data as the type. **Paratypes:** 3♂ 3♀ taken with the types.

Parthenicus fuscus, new species

Fig. 207

Runs in the key to the couplet with *nicholellus* from which it differs in the long rostrum; distinguished by structure of the male claspers (Fig. 207).

Male. Length 2.5 mm, width 1.0 mm. Head: width .61 mm, vertex .20 mm; yellowish. Rostrum, length 1.15 mm, reaching to middle of venter. Antennae: segment I, length .17 mm,



Figs. 205-208. Male claspers. 205, *Parthenicus utahensis*; 206, *P. nicholellus*, right; 207, *P. fuscus*, right; 208, *P. basicornis*, right.

yellowish; II, .85 mm, uniformly yellowish; III, .51 mm, yellowish; IV, .30 mm, dusky. Pronotum, length .40 mm, width at base .88 mm; disk pale yellowish, calli and anterior angles more yellowish. Scutellum yellowish, mesoscutum brownish. Hemelytra pale to yellowish, pigment in the hypodermis tends to coagulate into irregular spots and dots, with two or three red flecks on apical third of embolium. Membrane uniformly pale dusky, veins opaque yellowish. Dorsal surface clothed with recumbent to suberect, pale to yellowish simple hairs, intermixed with appressed silvery and golden sericeous pubescence, with some golden brown hairs behind tip of clavus and along inner edge of cuneus. Ventral surface pallid to yellowish. Legs pale yellowish, hind femora dusky, with numerous fine dusky to fuscous dots and marks, devoid of red marks; tibiae pale yellowish, with red dots at base of the yellowish spines. Venter uniformly pale yellowish; genital claspers distinctive (Fig. 207), related to *pinicola* but differences are shown in the figures.

Female. Length 2.5 mm, width .98 mm. Head: width .54 mm, vertex .27 mm. Rostrum, length 1.15 mm, reaching upon base of ovipositor. Pronotum, length .68 mm, width at base .95 mm. Very similar to the male in color and pubescence.

Holotype: ♂ Sept. 5, 1931, Seligman, Arizona (H. H. Knight), taken on limber pine, *Pinus flexilis*. **Allotype:** ♀ same data as the type. **Paratype:** ♀ taken with the types.

Parthenicus nevadensis, new species

Fig. 213

Runs in the key close to *utahensis* from which it may be separated by the white, unspotted clavus; male claspers distinctive of the species.

Male. Length 3.3 mm, width 1.2 mm. Head: width .54 mm, vertex .28 mm; pale yellowish, gena with red. Rostrum, length 1.0 mm, reaching to middle of venter. Antennae: segment I, length .20 mm, pallid; II, .95 mm, pallid; III, .58 mm, pale; IV, .30 mm, dusky. Pronotum, length .40 mm, width at base .95 mm; disk with a few red flecks. Scutellum except apex, fuscous; bearing sericeous golden brown pubescence. Hemelytra pallid or white, apical area of corium and the cuneus marked with red. Membrane uniformly pale fuscous, veins mostly red. Dorsal surface clothed with recumbent to suberect, simple pallid hairs, intermixed with silvery and some golden sericeous pubescence;

area behind apex of clavus and along inner margin of cuneus, bearing spots and clumps of golden brown scalelike hairs. Ventral surface pallid, mesosternum fuscous. Legs pallid, all femora with red spots and dots; tibiae and spines pallid, with brownish to red spots. Venter pallid, sprinkled with red flecks; claspers distinctive of the species. (Fig. 213).

Holotype: ♂ June 22, 1965, Area 401M, Nevada Test Site (H. H. Knight & J. M. Merino).

Parthenicus utahensis, new species

Fig. 205

Runs in the key near *nevadensis* from which it may be separated by the red dots and flecks on dorsal surface; distinguished from related species by structure of the male claspers (Fig. 205).

Male. Length 3.4 mm, width 1.2 mm. Head: width .54 mm, vertex .27 mm; pallid, with a touch of red on sides of clypeus and apex of lorum. Rostrum imbedded in glue of point mount, but it apparently reaches behind posterior coxae. Antennae: segment I, length .20 mm, white, with a setigerous red dot on apical half; II, .95 mm, pallid; III, .62 mm, yellowish; IV, .28 mm, yellowish. Pronotum, length .40 mm, width at base .90 mm; disk white, sprinkled with several red dots. Scutellum pallid on apex, basal half fuscous, bearing a spot of golden brown scalelike hairs on each basal angle. Hemelytra white, with a linear arrangement of red spots on clavus, along radial vein, and bordering inner margin of corium; also with 3 or 4 red dots on cuneus. Membrane uniformly pale fuscous, veins red. Dorsal surface clothed with recumbent and suberect pale to yellowish simple hairs, intermixed with appressed silvery sericeous pubescence; extending along inner margin of cuneus and to apex of clavus, are tufts and spots of golden brown scalelike hairs. Ventral surface pallid, mesosternum fuscous. Legs pallid, femora marked with numerous spots and dots of red; tibiae white, bearing white bristles which have bright red dots at base. Venter pallid, flecked with red dots; claspers distinctive of the species (Fig. 205).

Holotype: ♂ Aug. 15, 1929, Richfield, Utah (E. W. Davis), taken in a light trap. **Paratypes:** ♂ July 8, 1965, Area 18M, Nevada Test Site (D. E. Beck & J. M. Merino), a teneral specimen taken on *Artemisia*. ♀ Aug. 8, 1965, Area 17M, Nevada Test Site (J. M. Merino), taken at black light.

Parthenicus rubropunctipes, new species

Fig. 209

Runs in the key to the couplet with *obsoletus* from which it differs by the red spots and dots on femora; distinguished by structure of the male claspers (Fig. 209).

Male. Length 2.4 mm, width .88 mm. Head: width .58 mm, vertex .20 mm; yellowish, margins of lorum, jugum and sides of clypeus, red. Rostrum, length .95 mm, reaching to middle of venter. Antennae: segment I, length .17 mm, yellowish, base and apex with red; II, .95 mm, yellowish; III, broken. Pronotum, length .34 mm, width at base .92 mm; disk pale yellowish, sprinkled with minute red flecks. Scutellum yellowish, also with small red flecks. Hemelytra pale to yellowish, clavus with a few small red flecks; cuneus with more red near apex. Membrane uniformly pale dusky brown, veins red, a white spot at apex of larger areole. Dorsal surface clothed with recumbent and suberect pale simple hairs, intermixed with appressed golden and silvery, sericeous pubescence; with golden brown hairs more abundant behind apex of clavus, also spots of golden brown scalelike hairs along inner margin of cuneus. Ventral surface pale to reddish, more red on sides of thorax. Legs pallid, femora with numerous red spots and dots, hind femora more thickly and strongly marked; tibiae and spines pallid, with bright red spots at base of spines, although smaller and nearly obsolete on apical half. Venter pale, sprinkled and marked with red flecks and spots; genital elaspers distinctive of the species (Fig. 209).

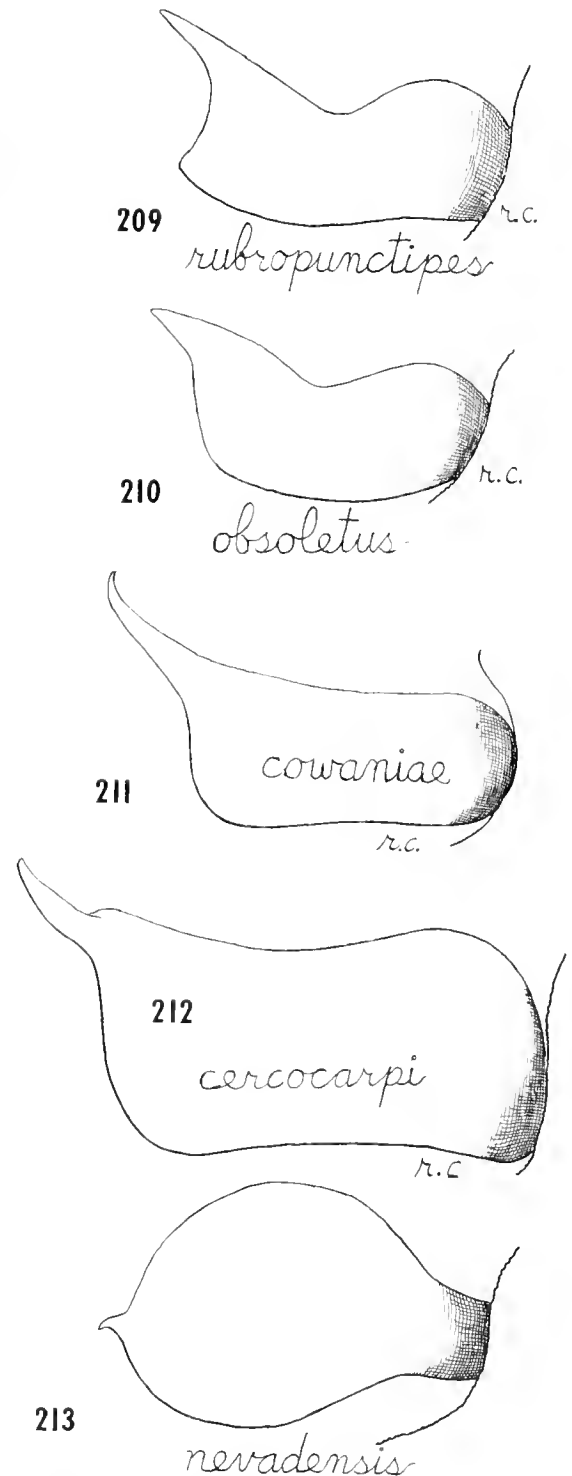
Female. Length 2.7 mm, width 1.1 mm. Head: width .58 mm, vertex .28 mm. Rostrum, length 1.1 mm, reaching to near base of ovipositor. Antennae: segment I, length .17 mm, marked with red; II, .92 mm, pale yellowish; III, .61 mm, yellowish; IV, broken. Pronotum, length .40 mm, width at base .88 mm. Color and pubescence very similar to that of the male.

Holotype: ♂ Sept. 1928, Tucson, Arizona (A. A. Nichol). **Allotype:** ♀ Sept. 2, 1928, alt. 3300 ft, Rincon Mts., Arizona (A. A. Nichol).

Parthenicus obsoletus, new species

Fig. 210

Runs in the key to the couplet with *rubropunctipes* but differs in having femora marked only with fuscous; distinguished by structure of the male claspers (Fig. 210).



Figs. 209-213. Right clasper of male, 209, *Parthenicus rubropunctipes*; 210, *P. obsoletus*; 211, *P. cowaniae*; 212, *P. cercocarpi*; 213, *P. nevadensis*.

Male. Length 2.7 mm, width 1.0 mm. Head: width .95 mm, vertex .19 mm; yellowish. Rostrum, length .95 mm, reaching upon posterior trochanters. Antennae: segment I, length .17

mm, yellowish; II, .98 mm, yellowish; III, .68 mm, yellowish; IV, .34 mm, yellowish. Pronotum, length .40 mm, width at base .86 mm; pale to yellowish, disk sprinkled with a few red flecks. Scutellum yellowish. Hemelytra pale yellowish, bearing a few scattered red flecks, cuneus with flecks and a red spot before apex; membrane uniformly brown fumate, veins red, a white spot on apex of larger areole. Dorsal surface clothed with recumbent and suberect, pale or yellowish simple hairs, intermixed with appressed silvery and golden sericeous pubescence; with a concentration of golden to golden brown scalelike hairs behind apex of clavus and spots along inner margin of cuneus. Ventral surface yellowish to fuscous. Legs pale yellowish; hind femora dusky yellow, marked with numerous large and small fuscous dots and spots; front and middle femora with a few reddish dots; tibiae with red dots and pale spines, red dots nearly obsolete on hind tibiae. Venter yellowish, genital claspers distinctive of the species (Fig. 210).

Holotype: ♂ July 22, 1917, Santa Cruz river, near Tucson, Arizona (H. H. Knight), taken at light. **Paratype:** ♂ same data as the type.

Parthenicus cercocarpi, new species

Fig. 212

Runs in the key to the couplet with *oreades* Knt. from which it may be separated by the longer rostrum that projects beyond posterior coxae; distinguished by structure of the male claspers (Fig. 212).

Male. Length 3.2 mm, width 1.2 mm. Head: width .64 mm, vertex .27 mm; yellowish, reddish on ventral margin of lorum. Rostrum, length 1.15 mm, reaching slightly behind posterior coxae. Antennae: segment I, length .21 mm, yellowish; II, .95 mm, pale to yellowish; III, .61 mm, yellowish; IV, .30 mm, yellowish. Pronotum, length .50 mm, width at base .98 mm, pale to yellowish, disk sprinkled with several red flecks. Scutellum, reddish, apex pallid. Hemelytra with white ground color, largely covered with patches, reticulate spots and dots of red; embolium and corium exterior to radial vein chiefly white, but marked with red spots and dots. Membrane rather uniformly pale fuscous, veins red. Dorsal surface clothed with recumbent to suberect, pale to yellowish simple hairs, intermixed with appressed, silvery, and some golden sericeous pubescence; basal half of scutellum, a patch just behind apex of clavus and tufts along inner margin of cuneus, bear-

ing golden brown scalelike pubescence. Ventral surface pale to yellowish, venter sprinkled with flecks of red. Legs pale to yellowish, femora with red dots and spots, hind pair more thickly marked with red; tibiae pallid, with double row of red dots, and yellowish spines arise from these dots. Genital segment and claspers distinctive of the species (Fig. 212).

Female. Length 3.1 mm, width 1.3 mm. Head: width .64 mm, vertex .34 mm. Rostrum, length 1.15 mm, reaching to near base of ovipositor. Antennae: segment I, length .21 mm, reddish on base; II, .95 mm, pale to yellowish; III, .54 mm, yellowish brown; IV, .30 mm, brownish. Pronotum, length .48 mm, width at base 1.05 mm. Dorsal surface more broadly pale but pubescence and color very similar to the male.

Holotype: ♂ June 20, 1928, alt. 6200 ft, Chiricahua Mts., Arizona (A. A. Nichol). **Allotype:** ♀ same data as the type. **Paratypes:** 3♂ 3♀ taken with the types on *Cercocarpus paucidentatus* on which the species was breeding.

Parthenicus cowaniae, new species

Fig. 211

Runs in the key near to *ribesi* and *becki*, but differs from both by the shorter rostrum; distinguished by structure of the male claspers (Fig. 211).

Male. Length 3.6 mm, width 1.4 mm. Head: width .68 mm, vertex .28 mm; yellowish. Rostrum, length 1.29 mm, reaching upon posterior trochanters. Antennae: segment I, length .24 mm, yellowish; II, 1.1 mm, pale yellowish; III, broken. Pronotum, length .51 mm, width at base 1.15 mm; yellowish. Scutellum yellowish to fuscous, with golden pubescence. Hemelytra pallid to yellowish and fuscous; inner half of clavus and inner apical half of corium, shaded with fuscous; outer half of corium and the embolium paler, and with flakes of red in the hypodermis; cuneus with flecks and spots of hypodermal red. Membrane uniformly fuscous, veins red, a white spot on apex of larger areole. Dorsal surface clothed with recumbent to suberect, pallid to golden simple hairs, intermixed with appressed golden to golden brown sericeous pubescence, thicker and more golden brown behind apex of clavus and tufts along inner margin of cuneus; with a transverse band of silvery sericeous pubescence across middle of corium and covering apical fourth of the clavus, also some silvery hairs on base of cuneus, on base of clavus, and intermixed on scutellum.

Ventral surface yellowish to dusky, the mesosternum with fuscous. Legs pale yellowish, femora shaded with fuscous, marked by numerous closely crowded points of fuscous; tibiae pallid to dusky, marked by minute dots of fuscous at base of spines. Male genital segment and claspers distinctive of the species (Fig. 211).

Female. Length 2.7-2.9 mm, width 1.3 mm. Head: width .64 mm, vertex .30 mm. Rostrum reaching upon posterior trochanters. Antennae: segment I, length .20 mm; II, .92 mm; III, .48 mm. Pronotum, length .51 mm, width at base 1.10 mm. Shorter and broader than the male, but very similar in pubescence and coloration.

Holotype: ♂ Aug. 3, 1917, Grand View, Grand Canyon, Arizona (H. H. Knight), taken on cliff rose, *Cowania stansburiana*, which is the host plant of the species. **Allotype:** ♀ taken with the type. **Paratypes:** 26 ♂ 20 ♀ taken with the types on cliff rose. 6 ♂ 5 ♀ June 18, 1925, Williams (A. A. Nichol); ♂ ♀ Sept. 6, 1931, Grand View, Grand Canyon (H. H. Knight); ♂ 2 ♀ June 28, 1940, Williams (L. L. Stitt); ♂ ♀ Aug. 1, 1914, Hermit Rim Road, Grand Canyon, Arizona (J. C. Bradley).

Parthenicus becki, new species

Fig. 219

Allied to *ribesi* but may be separated by the fuscous marks and shading on femora; distinguished by structure of male claspers (Fig. 219).

Male. Length 2.7 mm, width 1.1 mm. Head: width .58 mm, vertex .27 mm; yellowish. Rostrum, length 1.12 mm, reaching upon seventh ventral segment. Antennae: segment I, length .17 mm, dusky yellow; II, .81 mm, pale yellowish; III, .44 mm, dusky; IV, .27 mm, fuscous. Pronotum, length .41 mm, width at base .95 mm; pale, calli yellowish, disk with a few orange colored flecks. Scutellum fuscous, bearing golden brown sericeous hairs. Hemelytra pallid, marked with numerous orange colored spots and dots, apical half of corium shaded with orange and fuscous; cuneus orange red. Membrane fuscous, veins red orange. Dorsal surface clothed with recumbent to suberect, pale to yellowish simple hairs, intermixed with appressed silvery and golden sericeous pubescence; scutellum, spot behind apex of clavus and along inner edge of cuneus, set with tufts and spots of scalelike golden brown hairs. Ventral surface pallid to dusky and shaded with fuscous. Legs pale to dusky, hind femora thickly dotted and marked with fuscous; front femora with a few

orange red dots; tibiae pallid, having reddish orange setigerous dots. Venter pale to dusky yellow, without dots; male claspers distinctive of the species (Fig. 219).

Female. Length 2.6 mm, width 1.15 mm. Head: width .58 mm, vertex .30 mm. Rostrum, length 1.2 mm, reaching upon base of ovipositor. Antennae: segment I, length .18 mm; II, .85 mm; III, .48 mm; IV, .30 mm. Pronotum, length .40 mm, width at base .95 mm. Very similar to the male in color and pubescence.

Holotype: ♂ June 20, 1965, Area 401M, Nevada Test Site (H. H. Knight & J. M. Merino). **Allotype:** ♀ June 15, 1965, Area 6M, Nevada Test Site. **Paratypes:** 6 ♀ June 15, 1965, Area 6M; 3 ♀ June 13, 1965, Area CM; ♂ June 20, 1965, Area 401M; ♀ June 18, 1964, Area 12CI, Nevada Test Site.

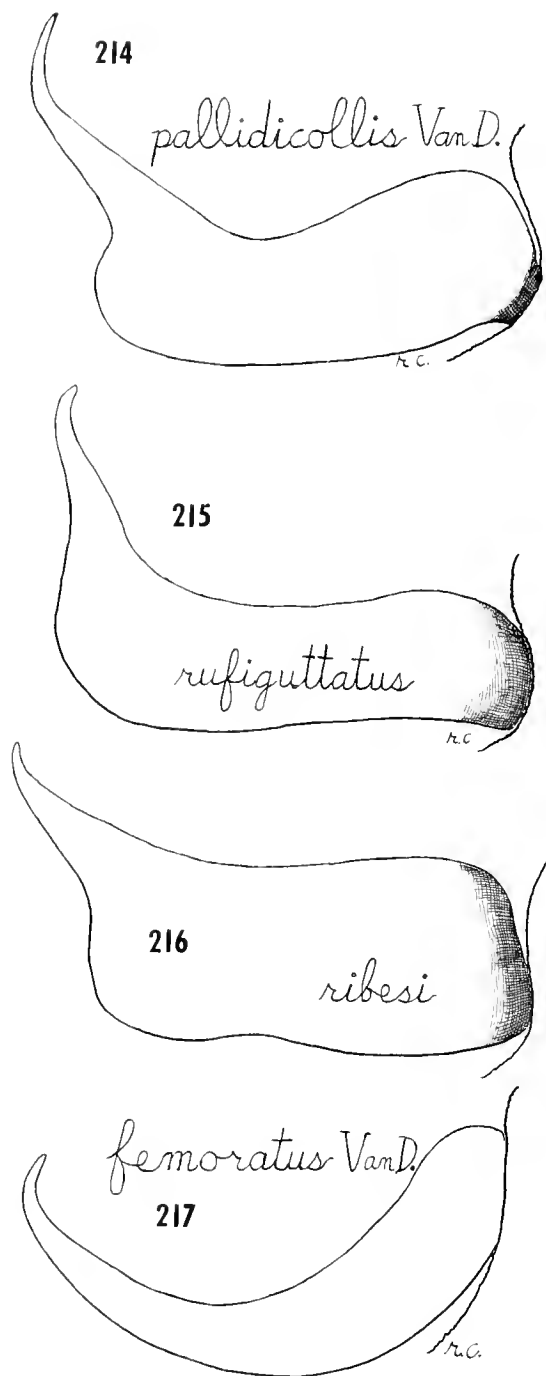
Parthenicus ribesi, new species

Fig. 216

Allied to *becki*, but larger and the femora strongly dotted and marked with red; distinguished by structure of the male claspers (Fig. 216).

Male. Length 3.3 mm, width 1.2 mm. Head: width .62 mm, vertex .30 mm; pallid, face strongly marked with red. Rostrum, length 1.22 mm, extending slightly beyond posterior trochanters. Antennae: segment I, length .20 mm, red; II, 1.09 mm, pale to yellowish; III, .68 mm, yellowish; IV, .30 mm, fuscous. Pronotum, length .51 mm, width at base 1.05 mm; pallid, disk flecked with red. Scutellum fuscous red. Hemelytra pallid, thickly marked with dots and flake spots of red, inner apical half of corium shaded with red; cuneus red, edges with spots and dots of red; membrane uniformly fuscous, veins red. Dorsal surface clothed with recumbent and suberect, pallid to yellowish simple hairs, intermixed with appressed silvery and golden sericeous pubescence; also with golden brown sericeous hairs behind apex of clavus and along inner edge of cuneus. Ventral surface reddish, paler areas with red dots. Femora thickly dotted and marked with red spots, hind femora shaded with red on dorsal aspect; tibiae pallid, marked with setigerous red dots, more obsolete on apical half. Venter thickly marked with red dots and flakes; genital claspers distinctive of the species (Fig. 216).

Female. Length 2.6 mm, width 1.05 mm. Head: width .58 mm, vertex .30 mm. Rostrum, length 1.12 mm, reaching upon base of oviposi-



Figs. 214-217. Right clasper of male, 214, *Parthenicus pallidicollis* Van D.; 215, *P. rufiguttatus*; 216, *P. ribesi*; 217, *P. femoratus* Van D.

tor. Antennae: segment I, length .17 mm; II, .81 mm; III, .61 mm; IV, .27 mm. Pronotum, length .38 mm, width at base .88 mm. Hemelytra shorter, but color and pubescence very similar to the male.

Holotype: ♂ Aug. 24, 1925, Estes Park, Colorado (H. H. Knight), taken on *Ribes*. **Allotype:** ♀ same data as the type. **Paratypes:** ♂ ♀ taken with the types on *Ribes*. ♂ June 5, 1900, Fort Collins, Colorado (E. D. Ball).

Parthenicus incurvus, new species

Fig. 223

Runs in the key to the couplet with *rufiguttatus*, from which the males can best be separated by the distinctive claspers (Fig. 223).

Male. Length 2.6 mm, width 1.02 mm. Head: width .57 mm, vertex .27 mm; yellowish, tinted reddish below. Rostrum, length 1.22 mm, reaching to near middle of genital segment. Antennae: segment I, length .17 mm, pale to reddish; II, .78 mm, pale to yellowish; III, .47 mm; IV, .23 mm, dusky. Pronotum, length .40 mm, width at base .95 mm; disk pallid, thickly and strongly marked with spots of deep red. Scutellum red, margins show breaks in the red. Hemelytra chiefly deep rose red, broken by dots, spots and irregular patches of pale ground color show on the clavus; cuneus red, membrane uniformly fuscous, veins red. Dorsal surface clothed with recumbent and suberect pale simple hairs, intermixed with appressed, silvery sericeous pubescence, also some golden to golden brown sericeous scalelike hairs behind apex of clavus and along inner margin of cuneus. Ventral surface reddish. Legs pallid to reddish, hind femora reddish, dots and spots blended together; tibiae pallid, strongly marked with red dots. Venter solid red; male claspers distinctive of the species (Fig. 223).

Holotype: ♂ July 21, 1965, Area 401M, Nevada Test Site (D E. Beck & J. M. Merino), taken at black light. **Paratypes:** 2 ♀ imperfect specimens taken with the type. ♂ Aug. 3, 1964, Area ECB; ♀ July 21, 1962, Area CE; ♂ Aug. 7, 1964, Area CB, Nevada Test Site, all at black light.

Parthenicus rufiguttatus, new species

Fig. 215

Allied to *incurvus*, females very similar; best distinguished by structure of the male claspers (Fig. 215) where differences may be observed.

Male. Length 2.9 mm, width 1.10 mm. Head: width .61 mm, vertex .21 mm. Rostrum, length 1.08 mm, reaching upon base of genital segment. Antennae: segment I, length .20 mm, yellowish, red at base; II, .88 mm, yellowish; III, .44 mm, yellowish; IV, broken. Pronotum,

length .44 mm, width at base .92 mm; pallid, sprinkled with small and large red spots. Scutellum red, apex pale. Hemelytra with ground color pallid, thickly covered by spots, dots and patches of rose red, leaving nearly half the area in ground color. Membrane pale fuscous brown, veins red. Dorsal surface clothed with recumbent to semierect, pallid to yellow simple hairs, intermixed with appressed, silvery sericeous, and smaller amounts of golden brown pubescence; also with golden brown hairs behind apex of clavus and along inner margin of cuneus. Ventral surface red. Legs red, coxae paler on apices; femora red, front pair showing spots more clearly, hind pair with spots distinct only on apices and ventral surface; tibiae pallid, pallid spines with red spots at base. Venter red, genital segment yellowish to red; claspers distinctive of the species (Fig. 215).

Female. Length 2.8 mm, width 1.2 mm. Head: width .61 mm, vertex .30 mm; yellowish, more reddish beneath. Rostrum, length 1.12 mm, reaching upon base of ovipositor. Antennae: segment I, length .20 mm, yellowish to reddish; II, .92 mm, yellowish; III, broken. Pronotum, length .40 mm, width at base .98 mm. Pubescence similar to the male, but color lighter, red on the dorsum reduced to irregular patches, spots and dots.

Holotype: ♂ May 12, 1929, Tucson, Arizona (E. D. Ball). **Allotype:** ♀ same data as the type. **Paratypes:** 5♂ 1♀ taken with the types.

Parthenicus pictus Knight

Fig. 220

Parthenicus pictus Knight, 1925:121.

Described and known from Arizona. Record from the Nevada Test Site: ♀ Aug. 15, 1965, Area M (Mercury) (J. M. Merino), taken at incandescent light.

Parthenicus oreades Knight

Fig. 222

Parthenicus oreades Knight, 1925:122.

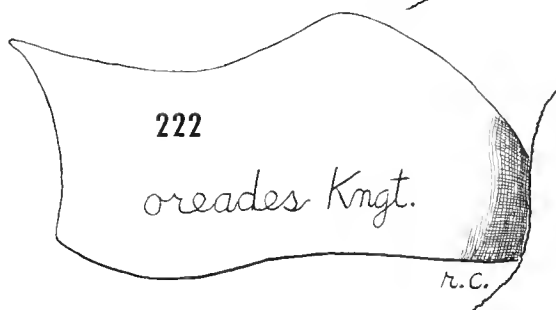
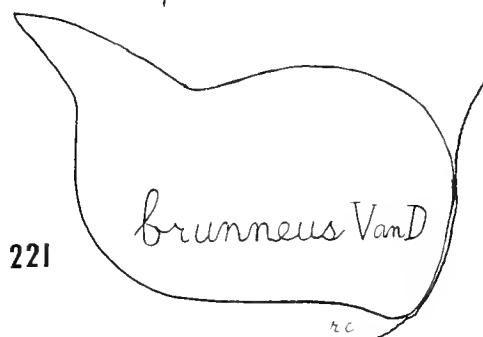
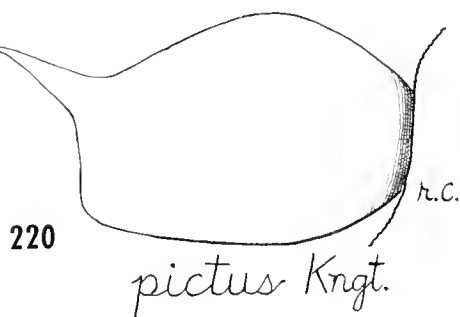
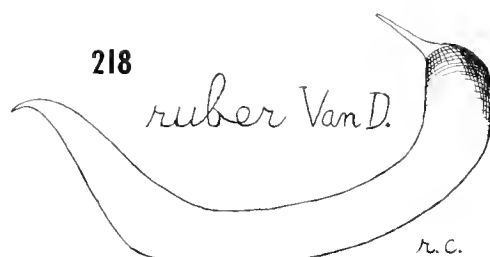
Known from Arizona and Colorado. Collected on *Ceanothus fendleri*.

Parthenicus pallidicollis Van Duzee

Fig. 214

Parthenicus pallidicollis Van Duzee, 1925:402.

Known from California.



Figs. 218-222. Right clasper of male. 218, *Parthenicus ruber* Van D.; 219, *P. becki*; 220, *P. pictus* Kngt.; 221, *P. brunneus* Van D.; 222, *P. oreades* Kngt.

Parthenicus brunneus Van Duzee

Fig. 221

Parthenicus brunneus Van Duzee, 1925:400.

Known from California.

Parthenicus irroratus Knight

Fig. 225

Parthenicus irroratus Knight, 1925:124.

Known from Arizona.

Parthenicus ruber Van Duzee

Fig. 218

Parthenicus ruber Van Duzee, 1917:276.

Known from Placer County, California.

Parthenicus femoratus (Van Duzee)

Fig. 217

Argyrocoris femoratus Van Duzee, 1916:225.*Parthenicus femoratus* Carvalho, 1958:123.

Known from San Diego County, California.

Genus *Parthenicus* Reuter

Key to the Species, Section III

1. Hemelytra green, veins bright red; length 3.2 mm *rufivenosus* Kngt..... 3
Hemelytra not green 2
2. First antennal segment black, segment II pallid; length 3.4 mm *boutelouae*, n. sp. 3
First antennal segment not black 3
3. Length of antennal segment II in male, not equal to width of pronotum at base 4
Length of antennal segment II in male, exceeds width of pronotum at base 7
4. Color of scutellum and hemelytra not uniformly reddish brown 5
Color of scutellum and hemelytra uniformly reddish brown; length (♂) 3.7 mm, (♀) 3.3 mm *rufusculus* Kngt. 5
5. Posterior femora with reddish or fuscous dots 6
Posterior femora and all legs, uniformly pallid; length (♀) 2.4 mm *pallipes*, n. sp. 6
6. Posterior femora red on apical half; length 2.5 mm *micans* Kngt. 6
Posterior femora pallid, apical half with fuscous dots, sometimes with a few reddish brown dots beneath; length 3.2 mm *covilleae* Van D. 6
7. Antennal segment I and the dorsal surface, rather uniformly dusky red; length 3.1 mm *pivicollis* Van D. 7
Dorsal surface not uniformly reddish; antennal segment I red; femora red, paler on base; length 2.8 mm *discahis* Van D. 7

Parthenicus rufusculus Knight

Fig. 226

Parthenicus rufusculus Knight, 1925:126.

Known from Tucson, Arizona, and from the test site as follows: 2♂ June 10, 1965, Area 5M (D E. Beck, H. H. Knight & J. M. Merino).

Parthenicus rufivenosus Knight

Fig. 229

Parthenicus rufivenosus Knight, 1925:128.

Known from Bonita, Tucson, Oracle, and Santa Rita Mts., Arizona.

Parthenicus micans Knight

Fig. 224

Parthenicus micans Knight, 1925:123.

Known from Tucson and the Huachuca Mts., Arizona.

Parthenicus discalis Van Duzee*Parthenicus discalis* Van Duzee, 1925:403.

Described from Mt. Wilson, California.

Parthenicus picicollis Van Duzee

Fig. 227

Parthenicus picicollis Van Duzee, 1916:226.Described from San Diego County, California, taken on *Adenostoma*. ♂ Oct. 17, 1927, Maricopa, Pinal County, Arizona (J. A. Kusche).*Parthenicus covilleae* Van Duzee

Fig. 228

Parthenicus covilleae Van Duzee, 1918:300.*Parthenicus percroceus* Van Duzee, 1923:156.

This species was first described from Palm Springs, California, where specimens were taken on *Covillea*. Later, Van Duzee (1923) described females of the same species as *percroceus*, specimens recorded as from creosote bush (*Larrea*) at Guadalupe Point and Carmen Island, Lower California. I have a female paratype of *percroceus* and find it identical with female paratypes of *covilleae* Van D. I also have specimens taken on *Larrea* at Tucson, Arizona, which are identical with the type material mentioned above. Botanists now place *Covillea* as a synonym of *Larrea*, the creosote bush. It now appears from material examined that *Parthenicus covilleae* Van D. is found on *Larrea divaricata* over the range of this plant in Arizona, southern California and Nevada.

Additional records: NEVADA: Area 5M,

♂ 3 ♀ June 10, 4 ♂ 2 ♀ Aug. 28, 1965, taken on creosote bush, *Larrea divaricata* Cav.; Area 6M, 5 ♂ 4 ♀ Aug. 13, 1965; Area 12M, ♂ June 11, 1965; Area 401M, ♀ June 18, 1965; Area TM, ♂ June 14, 1965; Area NT, ♂ Aug. 10, 1965 (D. E. Beck, H. H. Knight & J. M. Merino); Area 5A, ♀ July 27, 1962; Area 5A, ♀ June 10, 1964, Nevada Test Site. ♂ 3 ♀ Oct. 15, 1929, Glendale (D. E. Fox). ARIZONA: ♂ 3 ♀ July 22, 1925, alt. 2400 ft; ♂ April 19, 3 ♀ June 7, 1924, Tucson (A. A. Nichol), taken on *Larrea*; ♀ July 19, 1917, Texas Pass (H. H. Knight), at light; 2 ♀ June 15, 1925, alt. 7000 ft, Williams

223

incurvus r.c.

224

micans Kngt.

225

irroratus Kngt.

226

rufusculus Kngt.

227

picicollis Van D.

Figs. 223-227. Right clasper of male. 223, *Parthenicus incurvus*; 224, *P. micans* Kngt.; 225, *P. irroratus* Kngt.; 226, *P. rufusculus* Kngt.; 227, *P. picicollis* Van D.

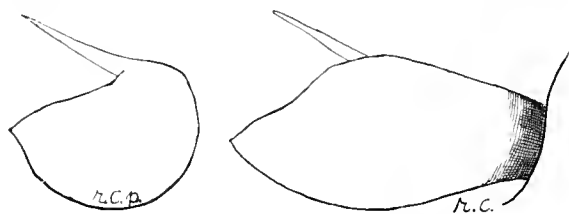
(A. A. Nichol); 2 ♀ Aug. 5, 1955, Portal (R. R. Dreisbach). TEXAS: 4 ♀ July 9, 1917, Fabens (H. H. Knight), taken on *Larrea glutinosa*.

Parthenicus boutelouae, new species

Fig. 230

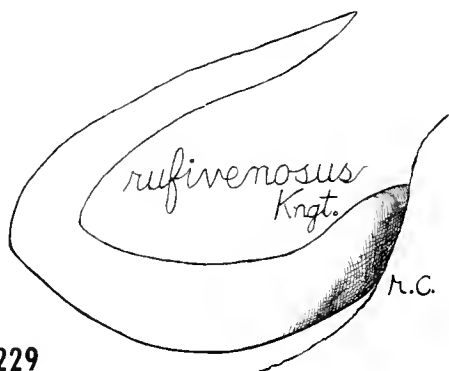
Distinguished from allied species by the black first antennal segment, and uniformly silvery sericeous pubescence on the dorsum and the venter; male claspers distinctive (Fig. 230).

Male. Length 3.4 mm, width 1.22 mm; clypeus and lower face fuscous to black, frons

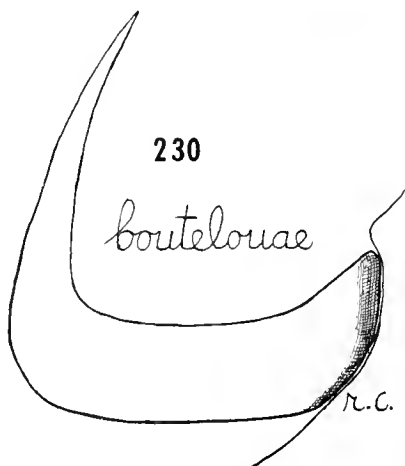


228

covilleae Van D.



229



230

boutelouae

Figs. 228-230. Right clasper of male, 228, *Parthenicus covilleae* Van D.; 229, *P. rufivenosus* Kngt.; 230, *P. boutelouae*.

with transverse fuscous lines. Head: width .64 mm, vertex .36 mm. Rostrum, length 1.22 mm, reaching upon seventh ventral segment. Antennae: segment I, length .23 mm, black; II, .98 mm, pallid to yellowish; III, .68 mm, dusky yellow; IV, .37 mm, dusky. Pronotum, length .47 mm, width at base 1.0 mm; pallid, calli outlined with fuscous. Scutellum fuscous, paler on median line. Hemelytra uniformly pallid to white, cuneus yellowish, inner edge and extending forward to tip of clavus, red. Membrane uniformly fuscous brown, veins red. Dorsal surface clothed with recumbent to suberect, pallid and yellowish simple hairs, intermixed with appressed, silvery sericeous pubescence, a few golden brown sericeous hairs behind apex of clavus and inner margin of cuneus. Ventral surface pallid to yellowish, mesosternum fuscous; venter fuscous to black, sides thickly clothed with silvery sericeous pubescence. Legs pale to yellowish, hind femora with a row of dorsal microdots, also with a few scattered dots on apical area; tibiae pallid, without dots; tarsi fuscous. Genital segment and claspers distinctive of the species (Fig. 230).

Female. Length 2.5 mm, width 1.3 mm; brachypterous, costal margins strongly arcuate. Head: width .66 mm, vertex .40 mm. Rostrum, length 1.3 mm, reaching to base of ovipositor. Antennae: segment I, length .23 mm, black; II, .88 mm, pallid; III, .62 mm, dusky yellow; IV, .34 mm, dusky. Pronotum, length .34 mm, width at base .85 mm. Hind femora thicker than in the male, small dots on apical area reddish; color and pubescence very similar to the male.

Holotype: ♂ May 20, 1928, alt. 5000 ft, Empire Mts, Arizona (A. A. Nichol). **Allotype:** ♀ same data as the type. **Paratypes:** 4 ♂ 12 ♀ taken with the types on *Bouteloua gracilis*, which is the host plant of the species.

Parthenicus pallipes, new species

Runs in the key near *micans* Kngt., but distinguished by the uniformly pallid legs.

Female. Length 2.4 mm, width 1.1 mm. Head: width .54 mm, vertex .30 mm; yellowish. Rostrum, length 1.1 mm, reaching to base of ovipositor. Antennae: segment I, length .17 mm, pallid; II, .78 mm, pallid; III, .47 mm, yellowish; IV, .28 mm, dusky. Pronotum, length .37 mm, width at base .85 mm, pale yellowish. Scutellum yellowish, dusky on base. Hemelytra pallid to yellowish; cuneus yellowish, tinged reddish

orange. Membrane fuscous brown, veins reddish. Dorsal surface clothed with recumbent and suberect pale to yellowish simple hairs, intermixed with appressed, silvery to golden yellow sericeous pubescence; inner apical angle of corium and inner edge of cuneus, bearing a few golden brown scalelike hairs. Ventral surface pale to

yellowish. Legs pale yellowish; front femora with a few minute dots, hind femora without dots or marks of many kind; tibiae pale yellowish, without dots, spines rather long on basal half.

Holotype: ♀ June 7, 1924, Tucson, Arizona (A: A: Nichol), taken at light.

Tribe CERATOCAPSINI

Key to the Genera

1. Hemelytra with spots and bands of sericeous, silvery scalelike pubescence *Pilophoropsis* Popp., p. 158
- Hemelytra without spots or bands of sericeous, silvery scalelike pubescence 2
2. Pronotum anterior to middle nearly cylindrical, rather abruptly flaring behind middle 3
- Pronotum regularly narrowed anteriorly, its sides not sulcate or constructed at middle; embolar margins not sulcate *Ceratocapsus* Reut., p. 156
3. Apical area of corium frosted, pruinose, not polished; pronotal disk not moderately convex *Pamillia* Uhler, p. 155
- Apical area of corium and cuneus, polished, strongly shining; basal half of pronotal disk strongly convex *Schaffneria* Kngt., p. 156

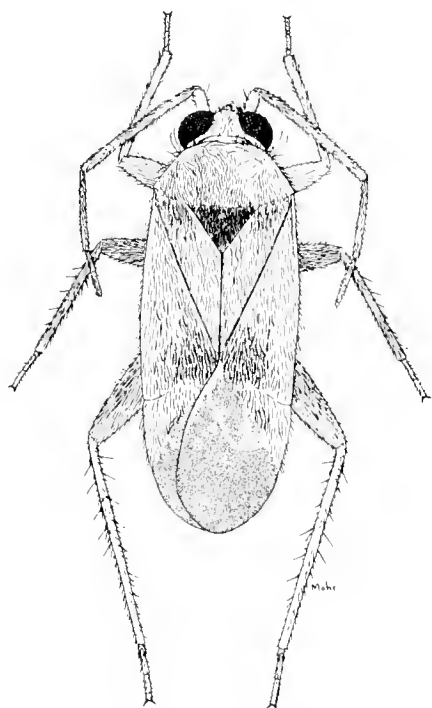


Fig. 231. *Parthenicus juniperi* (Heid.), ♂.

Genus *Pamillia* Uhler

Pamillia behrensii Uhler

Fig. 232

Pamillia behrensii Uhler, 1887:31, n. gen., n. sp.
Pamillia behrensii Van Duzee, 1914:27, distr.

The species was described from two female specimens collected by James Behrens in the vicinity of San Francisco. The species was next collected at Alpine, San Diego County, (Van Duzee, 1914). In an exchange with Mr. Van Duzee in 1931, I received two female specimens as males were not available. Recently, in talking with Dr. R. L. Usinger, he spoke of taking a good series of *behrensii*, June 6, 1932, at Upper

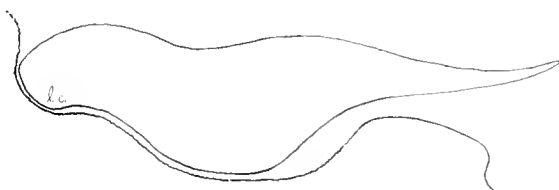


Fig. 232. *Pamillia behrensii* Uhl., ♂ left clasper.

Lake, Lake County, California. He promised to send me a male specimen, which he did, then remarked it was the only male specimen in all his material. The illustration (Fig. 232) was made from this specimen, and my thanks go to Dr. Usinger for sending the only male specimen so far reported.

Genus *Schaffneria* Knight

Schaffneria schaffneri Knight

Fig. 233

Schaffneria schaffneri Knight, 1966:1.

This ground-dwelling plant bug was described from Texas, where it lives in the litter beneath cedar trees, *Juniperus*. A key was provided for the separation of five known species, all ground-dwelling plant bugs.



Fig. 233. *Schaffneria schaffneri* Kngt., ♂ claspers.

Genus *Ceratocapsus* Reuter

Ceratocapsus fusiformis Van Duzee

Ceratocapsus fusiformis Van Duzee, 1917:270.

I have identified the following specimens of this species from the test site: Area 6M, ♂ June 15, 1965; Area TM, 6♂ 3♀ June 14, 1965; collected on *Purshia tridentata*.

This species was originally described from California by Van Duzee, and has been reported from Colorado.

Ceratocapsus apicalis Knight

Fig. 236

Ceratocapsus apicalis Knight, 1925:46.

This species is closely allied to *nevadensis*, n. sp., but differs in form of the male claspers (Fig. 236). It is known from Arizona, Colorado, New Mexico, Texas, Missouri and South Dakota.

Ceratocapsus nevadensis, new species

Fig. 235

Allied to *apicalis* Kngt., but differs in the larger eyes, narrower vertex, yellowish pronotum and dark scutellum; male claspers distinctive (Fig. 235).

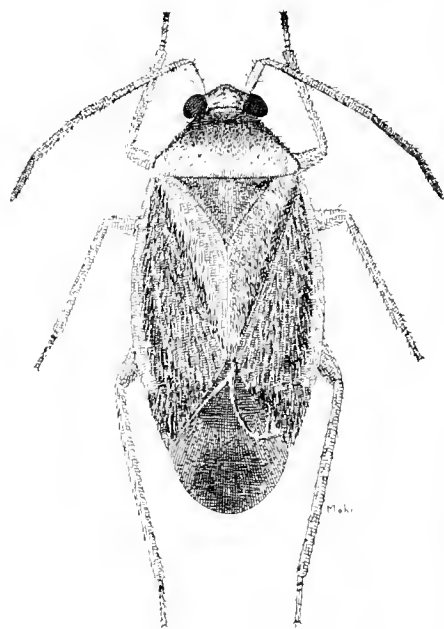
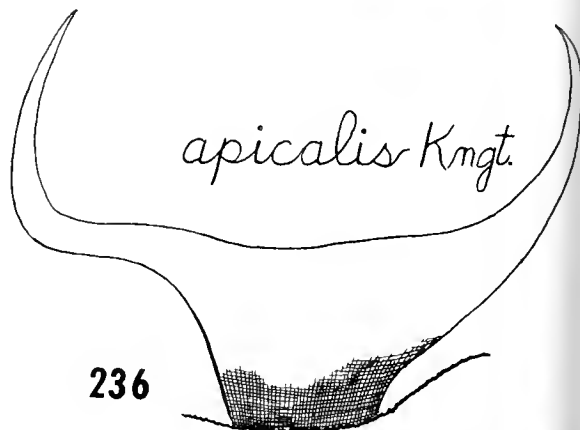
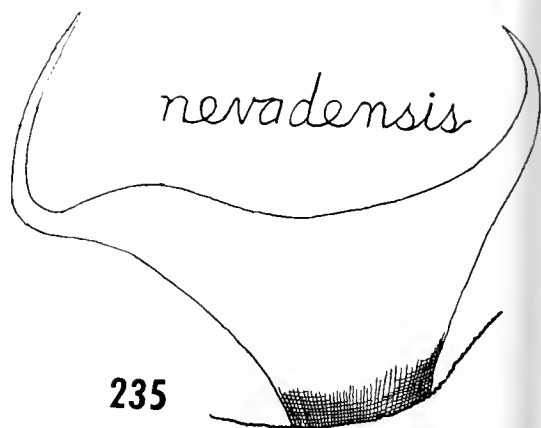


Fig. 234. *Ceratocapsus pumilus* Uhl., ♀.



Figs. 235-236. ♂ right clasper. 235, *Ceratocapsus nevadensis*; 236, *C. apicalis* Kngt.

Male. Length 3.7 mm, width 1.3 mm. Head: width .74 mm, vertex .24 mm; dorsal width of an eye equal to width of vertex; yellowish. Rostrum, length 1.15 mm, reaching upon apex of hind coxae, yellowish. Antennae: segment I, length .30 mm, pale yellowish; II, 1.12 mm, cylindrical, thickness on apical half subequal to thickness of segment I, pallid to pale yellowish, pubescence minute; III, .71 mm, yellowish, thickness barely subequal to segment II; IV, .47 mm, dark fuscous. Pronotum, length .57 mm, width at base 1.12 mm; lateral margins angulate, nearly straight as viewed from above, yellowish brown; disk finely punctate, never blackish. Scutellum slightly convex, punctate, fuscous to black. Hemelytra brownish yellow, subtranslucent, inner apical angles of corium fuscous, cuneus reddish yellow; dorsal surface, including pronotum and scutellum, finely fuscopunctate, clothed with short, appressed, sericeous yellow pubescence, and sparsely intermixed with rather long, erect, golden bristle hairs. Membrane clear, apical half fuscous, base of larger areole infuscated by extension of fuscous spot on corium. Ventral surface yellowish brown, mesosternum polished. Legs pallid, tibiae yellowish, apical half of hind femora and the tibiae, yellowish brown. Venter fuscous brown, polished, genital segment brownish black; male claspers distinctive (Fig. 235); closely related to *apicalis* Kngt. (Fig. 236), but differences are apparent.

Female. Length 3.2 mm, width 1.25 mm. Head: width .70 mm, vertex .34 mm; uniformly yellowish brown. Antennae: segment I, length .27 mm, pallid to yellowish; II, .92 mm, cylindrical, more slender on basal half, thicker on apex, a trifle less than segment I; III, .61 mm, thickness subequal to segment II; IV, .46 mm, reddish brown to black. Pronotum, length .55 mm, width at base 1.08 mm; yellowish brown, punctures infuscated, but disk never brownish black as in *apicalis* Kngt. Scutellum fuscous to black, but the pronotum remains yellowish brown.

Holotype: ♂ June 14, 1965, Area TM, Nevada Test Site (D E. Beck, H. H. Knight & J. M. Merino). **Allotype:** ♀ June 18, 1965, Area 401M, Nevada Test Site (H. H. Knight & J. M. Merino). **Paratypes:** the following from the Nevada Test Site: Area 5M, ♀ July 20, 1965 (D E. Beck & J. M. Merino), taken at incandescent light; Area 18M, ♀ Aug. 23 (J. M. Merino), taken on *Sphaeralcea*, ♂ July 22, 1965 (D E. Beck & J. M. Merino), taken at black light; Area 401M, 2 ♀ June 18, 1965 (H. H. Knight

& J. M. Merino); Area M (Mercury), ♂ Aug. 3, 1965 (J. M. Merino), taken at laboratory lights; Area 16M, ♀ Aug. 11, 1965 (J. M. Merino); Area 19M, ♀ Aug. 30, 1965 (J. M. Merino); Area 10D, ♀ May 16, 1961, taken at black light. ♀ April 3, 1942; ♂ April 8, 1942, Tacna, Arizona (L. L. Stitt).

Ceratocapsus nigrocuneatus, new species

Allied to *juglandis*, Kngt., but uniformly pale brownish yellow; distinguished by the black cuneus, outer margin and base narrowly pale.

Female. Length 4.1 mm, width 1.7 mm. Head: width .85 mm, vertex .38 mm. Rostrum, length 1.42 mm, reaching upon apex of middle coxae, yellowish. Antennae: segment I, length .37 mm, thickness .15 mm, yellowish; II, 1.49 mm, subcylindrical, thickness on apical half subequal to thickness of segment I, yellowish brown, reddish brown on apical half; III, .78 mm, dark reddish brown, thickness subequal to segment II; IV, .68 mm, reddish brown, slightly thinner than segment III. Pronotum, length .68 mm, width at base 1.29 mm; impunctate, disk moderately convex, basal margin forming a broad arc, nearly straight across base of scutellum, lateral margins angulate, slightly sulcate as viewed from above; clothed with minute, appressed pubescence, and sparsely intermixed with erect, golden bristle hairs; color uniformly pale brownish yellow like the scutellum and hemelytra. Scutellum triangular, moderately convex, transversely rugulose on discal area, bearing a few long erect bristles. Hemelytra pale yellowish, subtranslucent, clothed with minute, appressed, yellowish sericeous pubescence, and sparsely intermixed with long, erect, golden to copper colored bristles; cuneus black, with narrow base and outer margin pallid; clavus transversely rugulose but not punctate. Membrane pale yellowish fumate, a nearly clear spot bordering apex of cuneus, veins yellowish. Thorax and legs brownish yellow, hind legs more yellowish brown, apical segment of tarsi fuscous; tibiae with brown spines, finely pubescent. Venter yellowish brown to dark brown, strongly shining, clothed with rather short pubescent hairs, but with a few bristles bordering ovipositor.

Holotype: ♀ Aug. 25, 1965, Area 12M, Nevada Test Site (J. M. Merino), collected on *Pinus monophylla*. **Paratypes:** ♂ ♀ July 6, 1966, 8 mi w Minden, alt. 5500 ft, Douglas County, Nevada (C. W. O'Brien).

Genus *Pilophoropsis* Poppius

Key to the Species

1. Scutellum with silvery scalelike hairs 2
 Scutellum without silvery scalelike hairs; (♀) pronotum one-fourth longer than broad at base *brachypterus* Popp.
2. Clavus with four transverse silver spots on apical half; (♀) pronotum length scarcely equal to width at base; male claspers distinctive (Fig. 237) *nicholi* (Kngt.)
- Clavus with two transverse silver spots on apical half; male claspers distinctive (Fig. 238) *balli*, n. sp.

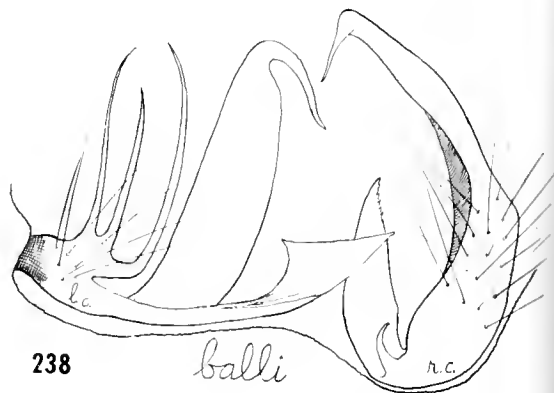
Pilophoropsis balli, new species

Fig. 238

Closely related to *nicholi* (Kngt.), but differs in placement of silvery, scalelike bands on hemelytra as shown in the key; also differs in structure of male genital segment and claspers (Fig. 238).

Male. Length 3.4 mm, width 1.1 mm. Head: width .78 mm, vertex .30 mm; base of clypeus barely visible as seen from above; eyes only slightly elevated above surface of vertex, sharp basal edge of vertex and posterior edge of eyes form an arcuate line, with eyes extending back slightly over anterior angles of pronotum. Antennae: segment I, length .20 mm, yellowish brown, a red spot at base; II, .61 mm, cylindrical, at base more slender than segment I, but tapering gradually to thicker (.08 mm) on apex, yellowish brown, clothed with fine, short yellowish pubescence; III, .36 mm, thickness .08 mm, equal to segment II on apex, slightly more slender on base, brownish; IV, .34 mm, thickness equal to segment III, brownish. Rostrum, length 1.0 mm, reaching to near posterior margin of mesosternum, yellowish. Pronotum, length .76 mm, width at base 1.0 mm; disk strongly convex, sloping in all directions from the central high point; lateral margins rounded, slightly sulcate as viewed from above; moderately shining, finely and sparsely pubescent, calli indicated by a slightly granulated surface; basal margin forming a broadly arcuate line, covering the strongly arched basal margin of scutellum. Scutellum moderately convex, but basal margin sharply arched and covered by pronotum; dark brown, central area bearing sericeous, silvery pubescence, forming part of a band that covers base of clavus. Clavus dark brown, inner half yellowish brown; base with a band, also two transverse bands on apical half, composed of

silvery, sericeous scalelike hairs. Clavus with two rows, and corium set with three or four rows of sparsely set, erect strong black bristles, also three or four bristles on scutellum. Corium yellowish brown, apical area fuscous brown, opaque, the middle of apical half with a rather broad, silvery scalelike, wedgeshaped band, the inner edge near and just before apex of clavus, the band angling backward to outer apical angle of corium; basal half of corium with three small patches of scales along edge bordering embolium; cuneus dark reddish brown, glabrous;



Figs. 237-238. ♂ claspers. 237, *Pilophoropsis nicholi*; 238, *P. balli*.

membrane and veins uniformly fuscous, a clear spot by apex of cuneus. Ventral surface yellowish brown to reddish brown; coxae pallid, front pair reddish on apex; ostiolar peritreme white; legs brownish. bases of femora except front pair, and apical area of tibiae except posterior pair, pallid. Genital segment and claspers distinctive (Fig. 238).

Holotype: ♂ Sept. 22, 1920, Tucson, Arizona (E. D. Ball), probably taken at light. **Paratypes:** ♂ Sept. 2, 1928, alt 3300 ft, Rincon Mts. (A. A. Nichol); ♂ April 15, Catalina Springs, Arizona (E. A. Schwarz).

Pilophoropsis brachypterus Poppius

Pilophoropsis brachypterus Poppius, 1914:250.

This species is known from Arizona. It is distinguished in the key by length of pronotum, which is one-fourth longer than broad at base.

Pilophoropsis nicholi (Knight)

Fig. 237

Renodaella nicholi Knight, 1927:306.

Described from the Santa Rita Mts., Arizona. The male genital segment is remarkably developed and distinctive of the species (Fig. 237).

Tribe PILOPHORINI

Key to the Genera

- 1. Antennal segment III equal in thickness to segment II 2
Antennal segment III much more slender than segment II
..... *Philophorus* Westw., p. 165
- 2. Scutellum conically produced; hemelytra with a transverse white fascia across middle of clavus and base of corium *Cyrtopeltocoris* Reut., p. 161
Scutellum only moderately convex; hemelytra with a white spot on middle of corium and extending upon clavus, but the white marks not forming a complete transverse fascia *Scricophanes* Reut., p. 159

Genus *Scricophanes* Reuter

Key to Males of the Species

- 1. Frons and vertex strongly convex, subglobose in pattern 2
Frons and vertex only slightly convex, vertex nearly flat 3
- 2. Dark color pattern of hemelytra nearly black, embolium black except for triangular pale spot near base and on apex of corium *tumidifrons*, n. sp.
Dark color pattern of hemelytra more brownish, embolium pallid for full length; legs and ventral surface red *rubripes*, n. sp.
- 3. Length of antennal segment II equal to or greater than width of head plus width of vertex 4
Length of antennal segment II not equal to width of head plus width of vertex *triangularis* Kngt.
- 4. Second antennal segment uniformly fuscous brown *fuscicornis*, n. sp.
Second antennal segment pallid *nevadensis*, n. sp.

Sericophanes triangularis Knight

Sericophanes triangularis Knight, 1918:81.

Sericophanes triangularis Knight, 1927:40, distr.

This species is known from Arizona, Utah, Colorado, New Mexico, North Dakota, South Dakota, Oklahoma and Texas.

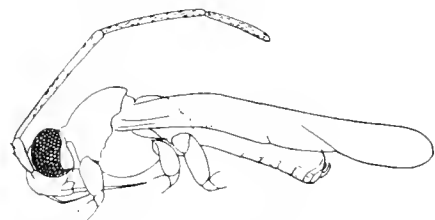


Fig. 239. *Sericophanes heidemanni* Popp., ♂ lateral aspect.

Sericophanes nevadensis, new species

Allied to *triangularis* Kngt., but differs in the longer second antennal segment, also by the pallid color of segment II.

Male. Length 3.4 mm, width 1.02 mm. Head: width .68 mm, vertex .30 mm; brown, vertex nearly flat. Rostrum, length 1.8 mm, reaching to middle of venter, fuscous brown, first segment reddish brown. Antennae: segment I, length .24 mm, pallid, yellowish on apical half; II, 1.12 mm, cylindrical, slightly more slender near base, pallid, minutely pale pubescent; III, .78 mm, pale to dusky; IV, .61 mm, dusky. Pronotum, length .58 mm, width at base .95 mm; disk, head and scutellum brown. Scutellum more broadly or sharply convex along basal margin, than in *triangularis*. Hemelytra very similar to *triangularis*, with white triangle based on embolium, its apex reaching to middle of clavus, the white spot on inner apical margin of corium somewhat larger, and apical area of corium more broadly white; membrane dark fuscous. Dorsal surface sparsely set with long, erect pallid hairs. Legs pallid, hind femora except basal third, dark brown; tibiae with reddish line on dorsal surface. Thorax brown; venter pallid to brownish, darker on apical half. Genital segment with long flagellum, forming a coil with complete loop exposed; right clasper acuminate on apical half.

Holotype: ♂ Aug. 23, 1965, Area M (Mercury) at laboratory light, Nevada Test Site (J. M. Merino). **Paratypes:** ♂ July 15, 1965, Area M (Mercury), Nevada Test Site (D E. Beck & J. M. Merino), taken at incandescent light; 2♂ Aug. 5, 1965, Area M (Mercury) Nevada Test Site (J. M. Merino), taken at black light.

Sericophanes fuscicornis, new species

Allied to *triangularis* Kngt., but second antennal segment longer, color of segment II fuscous brown.

Male. Length 3.4 mm, width .92 mm. Head: width .64 mm, vertex .27 mm; vertex nearly flat. Antennae: segment I, length .24 mm, pallid; II, 1.02 mm, cylindrical, short pubescent, fuscous brown; III, .71 mm, dark fuscous; IV, .52 mm. Rostrum, length 1.63 mm, reaching upon fourth ventral segment, fuscous brown. Pronotum, length .54 mm, width at base .85 mm; form quite similar to *triangularis*; color dark brown like the head and scutellum. Hemelytra yellow brown, with a triangular white spot based on embolium, and apex reaching to near middle of clavus; apex of embolium, outer half of corium, and small spot by apex of clavus white; edges of the white bordered by fuscous, very similar to that of *triangularis*, cuneus reddish brown, membrane fuscous. Dorsal surface provided with rather long, sparsely set, erect pale hairs. Ventral surface yellowish to reddish brown. Coxae and bases of femora pallid; dorsal aspect of tibiae reddish brown.

All known females of *Sericophanes* are short winged, unable to fly; so different from the males they will require a separate key for identification.

Holotype: ♂ May 20, 1928, alt. 5000 ft, Empire Mountains, Arizona (A. A. Nichol), swept from *Baccharis linearis*. **Paratype:** ♂ June 20, 1928, alt. 6200 ft, Chiricahua Mts., Arizona (A. A. Nichol).

Sericophanes tumidifrons, new species

Allied to *nevadensis*, but vertex and frons arched into a contour that suggests a subglobose form for the head; dark color pattern of hemelytra nearly black.

Male. Length 4.1 mm, width 1.3 mm. Head: width .68 mm, vertex .38 mm; frons and vertex tumid, merging in a convex pattern that suggests a globose contour for upper half of head. Rostrum, length 1.8 mm, reaching upon fifth ventral segment, brown, basal segment red. Antennae broken. Pronotum, length .65 mm, width at base 1.1 mm; disk strongly convex, anterior angles poorly defined, lateral margins rounded, anterior margin with a flat collar area but without construction to separate it from the disk; pronotum, scutellum and head reddish brown. Scutellum convex, but not arched into high contour like *nevadensis*. Hemelytra dark fuscous to

black, a white triangular patch based on embolium, its apex reaching across middle of clavus; apex of embolium and outer apical angle of corium with a white spot; clavus and corium without white spot about apex of clavus as seen in related species; membrane nearly clear, but with dusky tint. Dorsal surface sparsely set with long, erect, pallid hairs. Legs missing; but front coxae fuscous, others fuscous only on base. Thorax reddish brown; venter reddish brown to black. Genital segment and claspers distinctive; right clasper twice as long as broad, with apex truncated.

Holotype: ♂ July 29, 1920, Camp Baldy, California (L. L. Muchmore).

Sericophanes rubripes, new species

Allied to *tumidifrons* by the strongly convex frons and vertex, but differs in the reddish color and broadly pallid embolium and outer margin of the corium.

Male. Length 4.3 mm, width 1.25 mm. Head: width .68 mm, vertex .41 mm; frons and vertex

strongly convex, merging in a convex pattern that suggests globose contour for upper half of head; yellowish red, more strongly red on clypeus and lower half of head. Rostrum, length 1.8 mm, reaching beyond posterior coxae, yellowish, basal segment red. Antennae: segment I, length .34 mm, red; II, 1.12 mm, yellowish to red, cylindrical, thicker an apical half; III, .81 mm, yellowish red; IV, .66 mm, dusky red. Pronotum, length .75 mm, width at base 1.19 mm; lateral margins rounded, anterior margin with a flat collar; disk strongly convex, reddish brown. Scutellum convex, transversely rugulose. Hemelytra brownish, embolium and outer half pallid to white, base of corium pallid translucent; clavus paler bordering scutellum; cuneus fuscous brown; membrane fumate, darker on basal half. Legs, thorax and venter, bright red, coxae and bases of femora, except front pair, pallid; apices of tibiae and the tarsi more yellowish.

Holotype: ♂ April 29, Argus Mountains, California.

Genus *Cyrtopeltocoris* Renter

Key to the Species

1. Width of vertex greater than dorsal width of an eye 2
- Width of vertex not equal to dorsal width of an eye; length 3.6 mm
..... *oklahomae*, n. sp.
2. Pronotal disk with fine pubescent hairs; eyes more or less in contour with frons
and vertex 3
- Pronotal disk glabrous, shining; eyes very large, projecting out of contour with
frons and vertex; length 3.7 mm *albofasciatus* Reut.
3. Pronotum with lateral margins distinctly sulcate; length 3.7 mm
..... *huachucac*, n. sp.
- Pronotum not sulcate along lateral margins 4
4. Pronotum with lateral margins gradually rounded over 6
- Pronotum with lateral margins subangulate; disk rather flat 5
5. Vertex roundly convex; apex of frons conically produced over base of clypeus;
pronotal disk moderately convex, brownish black, shining; length 4.6 mm
..... *conicatus*, n. sp.
- Vertex only slightly convex; apex of frons not conically produced; pronotal disk
rather flat, surface minutely alutaceous; length 3.3 mm *ajo*, n. sp.
6. Length of antennal segment II not equal to width of pronotum at base 7

Length of antennal segment II subequal to width of pronotum at base; pronotal disk sparsely set with erect, fine long bristles; length 3.4 mm

..... *arizonae*, n. sp.

7. Pronotal disk sparsely set with erect, long bristles; larger, length 4.0 mm

..... *balli*, n. sp.

Pronotal disk without erect long bristles; smaller, length 3.5 mm .. *barberi*, n. sp.

Cyrtopeltocoris albofasciatus Reuter

Cyrtopeltocoris albofasciatus Reuter, 1876:81.

Sericophanes transversus Knight, 1918:82.

The form and coloration of this species are typical for the genus; the dorsal surface yellowish brown to dark brown, hemelytra with a wide transverse white band across middle of clavus and extending across corium. In this species the white band on corium narrows to a point where it meets the radial vein, so forming a triangular white spot on corium, the base of this having the same width as the white band on clavus. Since only male specimens have been taken at lights of this and other species, I believe the females must be brachypterous.

This species is commonly taken in south Texas, and specimens collected at Gillett were described as *Sericophanes transversus* Knight

(1918), but I have since concluded this species must be the same as *albofasciatus* Reut.

Cyrtopeltocoris oklahomae, new species

Distinguished from allied species by the large eyes and narrow vertex; the width of vertex less than dorsal width of an eye.

Male. Length 3.6 mm, width 1.12 mm across apex of embolium. Head: width .85 mm, vertex .27 mm, yellowish brown. Rostrum, length 1.49 mm, reaching upon apex of hind coxae. Antennae: segment I, length .24 mm; II, .85 mm, cylindrical, slightly more slender near base; III, .62 mm, thickness equal to that of segment II; IV, .44 mm; yellowish brown. Pronotum, length .75 mm, width at base .98 mm; disk convex, more so on basal half; lateral margins rounded over to join propleura; yellowish brown, polished, shining, with some minute pubescence, sparsely set with a few rather long suberect hairs. Scutellum strongly and abruptly convex, height of convexity .14 mm, width at base .37 mm; polished, dark brown, bearing a few minute pubescent hairs. Hemelytra yellowish brown to dark brown, the typical transverse white band, wider on corium than on clavus; sparsely clothed with fine short pubescence, sparsely intermixed with rather long, golden bristlelike hairs; with a white spot covering apex of embolium and outer half of corium; cuneus dark brownish black. Membrane and veins uniformly fuscous. Ventral surface yellowish brown to dark brown, genital segment reddish brown to black. Legs dark reddish brown, posterior and middle coxae and the trochanters, pallid.

Holotype: ♂ June 20, 1939, Claremore, Oklahoma (Kaiser & Nailon).

Cyrtopeltocoris huachucae, new species

Distinguished from related species by the sulcate lateral margins of pronotum, as viewed from above.

Male. Length 3.7 mm, width 1.05 mm. Rostrum imbedded in glue but reaching around

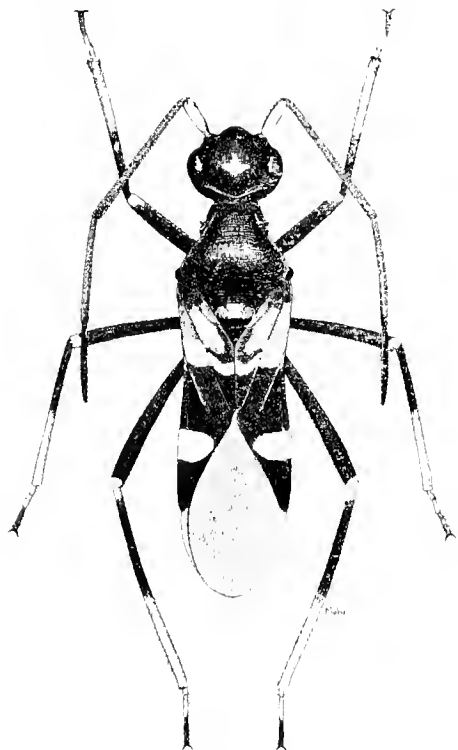


Fig. 240. *Cyrtopeltocoris illini* Kngt., ♀.

apex of hind coxae. Antennae: segment I, length .30 mm; II, .88 mm, more slender on basal half, but thickness at apex equal to that of segment I; III, .61 mm; IV, .48, thickness equal to III. Pronotum, length .68 mm, width at base 1.08 mm; as viewed from above the lateral margins of disk definitely sulcate, basal angles prominent, disk moderately shining, clothed with short, recumbent pubescent hairs, with two erect hairs visible on median line by inner angles of calli; dark reddish brown. Mesonotum broadly exposed while pronotum is in normal position. Scutellum only moderately convex, bearing a pair of long erect bristles, one each side of middle of disk; color dark reddish brown. Hemelytra dark fuscous brown except for the typical transverse white band and a spot on outer apical angle of corium; sparsely clothed with short appressed pubescent hairs, bearing a few erect long setose hairs on inner margin of paracuneus and inner apical angle of corium, but no bristles are apparent on clavus. Membrane and veins uniformly pale fuscous. Ventral surface dark reddish brown. Legs dark reddish brown, posterior and middle coxae and the trochanters, pallid.

Holotype: ♂ July 30, 1905, Huachuca Mountains, Arizona (H. G. Barber), taken at light.

Cyrtopeltocoris conicatus, new species

Allied to *ajo* in having lateral margins of pronotum subangulate; distinguished by having apex of frons conically produced over base of clypeus.

Male. Length 4.6 mm, width 1.4 mm. Head: width .74 mm, vertex .42 mm; vertex and frons strongly convex, tip of frons conically produced over and above base of clypeus, striae indistinct. Rostrum, length 1.6 mm, reaching upon apex of hind coxae. Antennae: segment I, length .30 mm; II, .98 mm, cylindrical, slightly thicker on apical half, thickness equal to segment I; III, .61 mm, thickness subequal to segment II; IV, .51 mm, thickness equal to segment III; yellowish brown to dark brown. Pronotum, length .71 mm, width at base 1.08 mm; lateral margins subangulate as viewed from above; disk dark brown, moderately shining, sparsely clothed with appressed, short pubescent hairs, with a pair of long erect hairs between inner basal angles of calli. Mesoscutum covered by basal edge of pronotum. Scutellum moderately convex, sloping down rapidly to a flat apex; with a pair of erect bristlelike hairs near basal margin, widely spaced each side of middle. Hemelytra dark brown, having a rather

wide, transverse white band across clavus just behind tip of scutellum, the band somewhat narrower on corium; outer apical angle of corium with a relatively small white spot. Membrane and veins uniformly pale dusky brown. Ventral surface dark reddish brown. Legs dark brown, posterior and middle coxae and trochanters pallid; tarsi pale fuscous.

Holotype: ♂ Aug. 6, 1905, Huachuca Mountains, Arizona (H. G. Barber).

Cyrtopeltocoris ajo, new species

Allied to *conicatus* but frons not conically produced, striae distinct on lower half of frons; pronotal disk with alutaceous surface, anterior angles rather distinct.

Male. Length 3.3 mm, width 1.05 mm. Head: width .68 mm, vertex .34 mm, yellowish brown. Rostrum, length 1.49 mm, reaching upon fourth ventral segment, or upon posterior trochanters, yellowish brown. Antennae: segment I, length .30 mm; II, .88 mm, subcylindrical, slightly thicker on apical half, thickness subequal to segment I, yellowish brown; III, missing. Pronotum, length .68 mm, width at base 1.02 mm; lateral margins subangulate, basal margin sinuate on middle, anterior angles of disk rather prominent, more so than in *conicatus*; discal surface alutaceous, calli and anterior surface rather flat. Mesoscutum only narrowly exposed. Scutellum more strongly convex than in *conicatus*. Hemelytra dark brown, basal half of clavus more yellowish; with transverse white band behind scutellum somewhat wider on clavus, posterior edge forming a sinuate line; white spot on apex of embolium and outer apical angle of corium, rather small, triangular in outline; clothed with sparsely set, appressed simple yellowish hairs, without longer bristlelike hairs. Membrane and veins pale fuscous. Ventral surface dark reddish brown. Legs dark brown, posterior and middle coxae and trochanters pallid.

Holotype: ♂ April 27, 1939, The Alamo, Ajo Mountains, Arizona (A. A. Nichol).

Cyrtopeltocoris arizonae, new species

Differs from allied species by the longer rostrum, long second antennal segment, which in length is subequal to width of pronotum at base.

Male. Length 3.4 mm, width 1.08 mm. Head: width .68 mm, vertex .36 mm; yellowish brown. Rostrum, length 1.56 mm, reaching upon seventh ventral segment. Antennae: segment I, length

.24 mm, yellowish; II, .98 mm, cylindrical, slightly more slender on basal half, apex subequal in thickness to segment I, brownish yellow; III, broken. Pronotum, length .57 mm, width at base .98 mm; yellowish brown, lateral margins of disk gradually rounded over, evenly convex, sparsely clothed with fine short, recumbent pubescence, and sparsely intermixed with erect, long pale setose hairs. Mesoscutum narrowly exposed. Scutellum strongly convex, with a few short pubescent hairs; an erect bristlelike hair, one each side of middle near base. Hemelytra dark brown, yellowish brown before the white band; with a transverse white band behind tip of scutellum, band narrowed on clavus, but wider on corium; with a triangular white spot on apex of embolium and outer apical angle of corium; sparsely clothed with short, recumbent and appressed, yellowish simple pubescence, sparsely intermixed with a few erect, long bristlelike hairs, with a row along inner margin of paracuneus and cuneus. Membrane and veins pale fuscous. Ventral surface and legs reddish brown, posterior and middle coxae with trochanters pallid.

Holotype: ♂ July 19, 1929, Glen Oaks, Arizona (E. D. Ball). **Paratype:** ♂ July 16, 1917, Post Creek Canyon, Bonita, Arizona (H. H. Knight), taken at light.

Cyrtopeltocoris balli, new species

Runs in the couplet with *barberi* from which it may be separated by having a few erect long bristles on pronotal disk; size larger.

Male. Length 4.0 mm, width 1.12 mm. Head: width .78 mm, vertex .30 mm; yellowish to reddish brown, frons with oblique transverse striae each side. Rostrum, length 1.5 mm, reaching upon apex of posterior coxae. Antennae: segment I, length .30 mm; II, .98 mm, cylindrical, slightly more slender near base, thickness on apical half subequal to thickness of segment I, yellowish; III, .68 mm, thickness subequal to segment II, yellowish brown; IV, .51 mm, thickness equal to segment III, yellowish brown. Pronotum, length .71 mm, width at base 1.08 mm, disk strongly convex, lateral margins rounded over to the propleura, yellowish brown to dark brown on basal half; sparsely clothed with short, appressed simple yellowish hairs, intermixed on disk with a scattering few, erect long bristlelike pale yellowish hairs. Mesonotum just moderately exposed. Scutellum strongly convex, set with several erect long hairs. Hemelytra yellowish to dark brown, having a typical transverse

white band behind tip of scutellum, with a triangular shaped white spot on apex of embolium and outer angle of corium; sparsely clothed with short appressed simple pubescence and sparsely intermixed with long erect bristlelike yellowish hairs. Membrane and veins uniformly pale fuscous. Ventral surface reddish brown. Legs reddish brown, posterior and middle coxae and trochanters, pallid.

Female. Length 2.8 mm, width of venter 1.46 mm; brachypterous. Head: width .71 mm, vertex .46 mm, convex, frons with transverse striae. Rostrum, length 1.6 mm, reaching to base of ovipositor. Antennae: segment I, length .27 mm, curved; II, .74 mm, cylindrical, slightly thicker on apical half, subequal to thickness of segment I; III, .58 mm, thickness subequal to segment II; IV, .54 mm; brownish yellow. Pronotum, length .51 mm, width at base .72 mm; strongly convex, lateral margins of disk rounded, anterior margin rounding over to meet the flat collar, brownish yellow; bearing several erect bristlelike hairs. Mesoscutum broadly exposed, sloping back to join scutellum. Scutellum strongly produced into a conical shaped structure. Hemelytra short, apical half curved upward, reaching above third tergite of venter; yellowish to reddish brown; a pallid transverse band is visible behind scutellum. Venter broadly expanded, sparsely set with erect long setose hairs, dorsal surface with a row of erect bristles on each tergite; reddish brown.

Holotype: ♂ June 15, 1900, Pueblo, Colorado (E. D. Ball). **Allotype:** ♀ same data as the type. **Paratypes:** 6♂ 2♀ same data as the types. Dr. Ball once told me about collecting wingless females on the ground among grasses, and I believe this is the species.

Cyrtopeltocoris barberi, new species

In the key this species runs in the couplet with *balli* but may be distinguished by lack of bristlelike hairs on pronotum, also by smaller size.

Male. Length 3.5 mm, width .98 mm. Head: width .68 mm, vertex .34 mm; reddish brown. Rostrum, length 1.5 mm, reaching upon posterior trochanters. Antennae: segment I, length .24 mm; II, .85 mm, cylindrical, slightly more slender on basal half, apex subequal to segment I in thickness; III, .64 mm, thickness subequal to that of II and IV; IV, .51 mm; yellowish brown. Pronotum, length .61 mm, width at base .95 mm; lateral margins of disk rounded over to join propleura, basal margin broadly arcuate,

basal half of disk strongly convex, minutely punctate, moderately shining; clothed with minute, short, appressed pubescent hairs, without trace of erect bristlelike hairs; reddish brown. Mesoscutum broadly exposed. Scutellum strongly convex, sparsely pubescent, with short, fine pubescent hairs only. Hemelytra reddish brown to dark brown, but having the generic transverse white band across clavus and corium, the band full width on corium but with a notch on posterior margin; having a small triangular white spot on tip of embolium and outer apical

angle of corium; sparsely clothed with appressed, fine short pubescent hairs, except for a few erect pilose hairs on clavus, along commissure, inner margin of corium and paracuneus. Membrane and veins uniformly pale fuscous brown. Ventral surface and legs reddish brown, posterior and middle coxae and the trochanters pallid; tarsi yellowish brown.

Holotype: ♂ July 23, 1905, Huachuca Mountains, Arizona (H. G. Barber), collected at light.

Genus *Pilophorus* Westwood

Key to the Species

- 1. Hemelytra polished over entire width behind posterior silvery line 2
 - Hemelytra polished behind posterior silvery line, but exterior to radial vein only 9
- 2. Basal half of hemelytra set with erect short bristles, some very fine 3
 - Basal half of hemelytra without short erect bristles 6
- 3. Posterior silvery line complete, straight, not dislocated at claval suture 4
 - Posterior silvery line dislocated at the clavus; legs uniformly yellow; antennae yellowish, only the apex of segment II dark *schwarzi* Reut.
- 4. Posterior silvery line or band rather wide, with edges diffuse and poorly defined; length 4.7 mm *diffusus*, n. sp.
 - Posterior silvery line narrow, edges sharp and clearly defined 5
- 5. Basal half of hemelytra, or anterior to posterior silvery band, brownish black and frosted, set with strong erect bristles; length 4.7 mm *hesperus*, n. sp.
 - Basal half of hemelytra yellowish brown, sparsely set with very fine, short black bristles, and sparsely intermixed with short, golden yellow pubescence; length 4.2 mm *microsetosus*, n. sp.
- 6. Antennal segment III pallid on basal half, segment IV likewise 7
 - Antennal segment III black, segment IV white; length 4.0 mm *jezzardi*, n. sp.
- 7. Posterior tibiae flattened, strongly curved, wider on basal half, width equal to three-fourths the width of posterior femur; length 5.0 mm *tibialis* Van D.
 - Posterior tibiae not so strongly curved, width just equal to half the width of hind femur 8
- 8. Hemelytra uniformly brownish black; silver band on basal half of corium rather wide, inner half turned obliquely distad; length 4.4 mm *barberi*, n. sp.
 - Hemelytra yellowish brown anterior to posterior silvery line; silver band on basal half of corium occurs in transverse position; length 5.0 mm *crassipes* Popp.

9. Posterior silvery line dislocated at the radial vein ... 10
 Posterior silvery line not dislocated at the radial vein ... 11
10. Hemelytra fuscous brown; thickness of antennal segment II equal to thickness of segment I; length 3.2 mm ... *fuscipennis* Kngt.
 Hemelytra yellowish brown; second antennal segment distinctly thicker than segment I; length 3.9 mm ... *dislocatus*, n. sp.
11. Posterior silvery line dislocated at the claval suture ... 12
 Posterior silvery line not dislocated at the claval suture ... 18
12. Clavus fuscous to black ... 13
 Clavus uniformly yellowish brown ... 14
13. Length of antennal segment II not equal to distance between basal margin of pronotum and apex of clypeus as measured from lateral aspect; segment II just reaching from base of pronotum to front edge of antennal fossa; length 4.4 mm ... *opacus* Kngt.
 Length of antennal segment II slightly greater than distance between basal margin of pronotum and apex of clypeus as measured from the lateral aspect; length 4.0 mm ... *vicarius* Popp.
14. Hemelytra with erect bristles ... 15
 Hemelytra without bristles, clothed only with sparsely set, recumbent and appressed, very fine golden pubescent hairs; length 3.7 mm ... *chiricahuae*, n. sp.
15. Erect bristles on hemelytra, pallid to yellowish ... 16
 Erect bristles on hemelytra, black; thickness of second antennal segment on apical half, greater than thickness of segment I, brown, apical third brownish black; length 4.1 mm ... *nevadensis*, n. sp.
16. Pronotum and scutellum black; thickness of antennal segment II greater than thickness of segment I ... 17
 Pronotum and scutellum yellowish brown; thickness of antennal segment II just equal to thickness of segment I; length 4.2 mm ... *salicis*, n. sp.
17. Length of antennal segment II, greater (σ) or equal (ϕ) to the distance between base of pronotum and apex of clypeus, length of bristles on corium less than diameter of segment II on apical half; length 4.3 mm ... *tanneri*, n. sp.
 Length of antennal segment II (1.19 mm) much less than distance between base of pronotum and apex of clypeus (1.36 mm); length of bristles on corium much greater than diameter of antennal segment II on apical half; length 3.8 mm ... *longisetosus*, n. sp.
18. Antennal segment II strongly clavate on apical fourth, reddish yellow, clavate portion black; length 3.7 mm ... *clavicornis* Popp.
 Antennal segment II not strongly clavate, apical thickness of segment II not over twice that of segment I ... 19

19. Silver band on basal half of corium in a transverse position 20
 Silver band on basal half of corium pointing obliquely distad toward apex of
 clavus; posterior silvery band unbroken but bending forward to cross clavus;
 length 2.7 mm *exiguus* Popp.
20. Thickness of antennal segment II just about equal in thickness to segment I 21
 Thickness of antennal segment II greater than segment I, slender at base where
 it is just half the thickness of apex, brown, apical third brownish black;
 hemelytra fuscous brown, pubescence appressed, very fine and short; length
 3.7 mm *merinoi*, n. sp.
21. Dorsal surface sparsely or thickly clothed with short, erect setose hairs 23
 Dorsal surface without erect, bristly hairs 22
22. Pronotum, venter, femora and tibiae, brownish black; hind femora uniformly
 dark brown; length 3.4 mm *utahensis*, n. sp.
 Pronotum, venter, femora and tibiae, brownish yellow; hind femora with a lon-
 gitudinal brown stripe, on anterior and on posterior aspects, the color
 changing with the angle of view; length 4.0 mm *discretus* Van D.
23. Dorsal surface sparsely clothed with erect, bristly short hairs, but devoid of seri-
 ceous pubescence on pronotum and elsewhere; length 3.0 mm *balli*, n. sp.
 Dorsal surface rather thickly clothed with erect, bristly short hairs, intermixed
 on pronotum with appressed silvery sericeous pubescence; antennal seg-
 ments II and III brownish, segment IV white; length 4.0 mm *tomentosus* Van D.

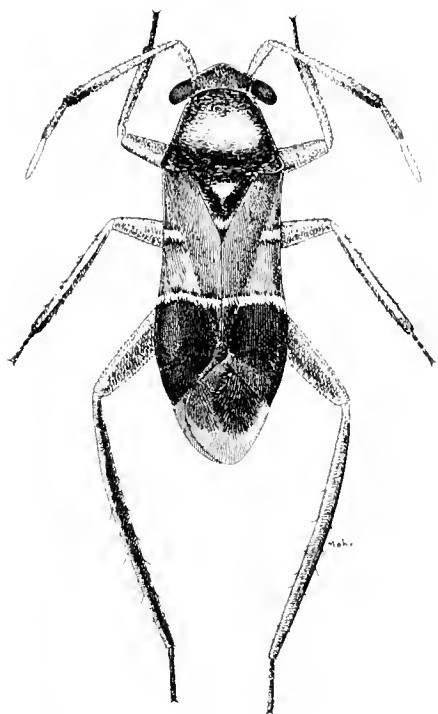


Fig. 241. *Pilophorus taxodii* Kngt., ♀.

Pilophorus crassipes Poppius

Pilophorus crassipes Poppius, 1914:242.

Pilophorus americanus Poppius, 1914:243.

The type specimen of this species is from Manitou, Colorado, July 19, 1900 (Ball & Van Duzee). Records of this species for the eastern United States are incorrect as this Colorado species is different from all eastern species I have examined. New record: 10♂ ♀ Aug. 20-22, 1925, Pingree Park, Colorado (H. H. Knight). The type of *Pilophorus americanus* Poppius came from Williams, Arizona; I have examined type material and find it the same as *crassipes* Poppius.

Pilophorus schwarzi Reuter

Pilophorus schwarzi Reuter, 1909:74.

Pilophorus schwarzi Van Duzee, 1918:295, key.

This species was described from Fresno, California, and thus far is known only from that state.

Pilophorus fuscipennis Knight*Pilophorus fuscipennis* Knight, 1926:23.Known from Arizona and Colorado, breeds on *Pinus edulis*.*Pilophorus opacus* Knight*Pilophorus opacus* Knight, 1926:24.Described from Dolores and Gunnison, Colorado, where it was breeding on *Chrysothamnus*.*Pilophorus tibialis* Van Duzee*Pilophorus tibialis* Van Duzee, 1918:292.

This species is known only from California and Oregon.

Pilophorus discretus Van Duzee*Pilophorus discretus* Van Duzee, 1918:290.

Known only from California.

Pilophorus tomentosus Van Duzee*Pilophorus tomentosus* Van Duzee, 1918:291.

This species is known only from California.

Pilophorus vicarius Poppius*Pilophorus vicarius* Poppius, 1914:245.

Described from Williams, Arizona. New records: ♀ Aug. 20, 1925, Pingree Park, Colorado; ♀ Aug. 7, 1925, Stonewall, 8500 ft, Trinidad, Colorado (H. H. Knight).

Pilophorus exiguus Poppius*Pilophorus exiguus* Poppius, 1914:246.

Described from Bright Angel Trail, Grand Canyon, Arizona. Later record: ♂ ♀ June 22, 1925, Grand Canyon, Arizona, alt. 7000 ft (A. A. Nichol).

Pilophorus clavicornis Poppius*Pilophorus clavicornis* Poppius, 1914:248.

Described from Flagstaff, Arizona, and not recognized since.

Pilophorus diffusus, new speciesAllied to *hesperus* Kngt., but differs in the posterior silvery band which is wider, but diffuse, lacking sharp cut margins and intermixed with sericeous golden hairs.**Male.** Length 4.7 mm, width 1.7 mm. Head: width 1.10 mm, vertex .51 mm; basal margin of vertex elevated into a sharp carina, sulcate just

before, more deeply on median line, brownish black, more reddish brown below level of clypeus at base. Rostrum, length 2.2 mm, reaching upon posterior trochanters, brownish black. Antennae: segment I, length .37 mm, fuscous brown, paler beneath; II, 1.59 mm, cylindrical, tapering gradually to thicker (.15 mm) near apex, clothed with short, fine yellowish pubescence, reddish brown, more brownish black on apical half, III, .61 mm, slender, brownish black, basal third pallid to yellowish; IV, .57 mm, more slender, pallid, apical half fuscous. Pronotum, length .51 mm, width at base 1.39 mm; disk moderately convex, basal margin nearly straight, lateral margins rounded, slightly sulcate; black with waxlike shine, sparsely clothed with short, yellowish pubescent hairs. Mesonotum and scutellum black, the latter moderately convex, basal angles and flat apex bearing silvery sericeous hairs, elsewhere with yellowish recumbent pubescent hairs. Hemelytra brownish black, base of corium more brown; corium with the usual transverse, silvery band on middle of basal half; apical silvery band rather broad, but with edges diffuse and intermixed with appressed, sericeous golden pubescence, somewhat wider across apical area of clavus; surface shining across the whole width behind the silvery band, and more thickly clothed with short, appressed golden pubescent hairs; basal half of clavus and corium sparsely set with erect setose hairs, and sparsely intermixed with simple pubescent hairs. Cuneus brownish black and shining like the corium behind the posterior silvery band; paracuneus bearing silvery sericeous hairs which extend somewhat on basal angle of cuneus. Membrane rather uniformly light fuscous, a darker cloud just behind arcoles, veins fuscous. Ventral surface brownish black, mesosternum and venter polished; sides of venter with an oblique band of silvery sericeous hairs, crossing segments three to five inclusive. Genital segment with bristlelike hairs; claspers small but distinctive in form.

Female. Length 4.6 mm, width 1.7 mm. Head: width 1.15 mm, vertex .57 mm. Rostrum, length 2.2 mm, reaching behind coxae to fourth ventral segment. Antennae: segment I, length .37 mm; II, 1.76 mm, thickness and color similar to the male; III, .71 mm, dark brown, basal third yellowish; IV, .58 mm, pallid, apical half fuscous. Pronotum, length .51 mm, width at base 1.2 mm; lateral margins more strongly sulcate than in the male. Color, pubescence and bristles all very similar to the male.

Holotype: ♂ Aug. 20, 1925, Pingree Park, Colorado (H. H. Knight). **Allotype:** ♀ collected with the type, probably on spruce, *Picea*. **Paratypes:** ♂ 2 ♀ taken with the types. 2 ♂ 2 ♀ Aug. 1, 1900, Rices Spur (E. D. Ball); ♂ Aug. 20-25, 1925, 3 ♂ 2 ♀ Aug. 15-20, 1924, Pingree Park, Colorado (Drake & Hottes). ♂ Aug. 1-8, 1935, Green River Lake, alt. 8500 ft, Wind River Mts., Wyoming (H. Ruckes).

Pilophorus hesperus, new species

Allied to *vanduzeei* Kngt., but differs in having appressed sericeous pubescence covering the scutellum; surface of pronotum and scutellum not strongly shining.

Male. Length 5.9 mm, width 1.9 mm. Head: width 1.2 mm, vertex .58 mm; base of vertex forming a sharp ridge, front of vertex and base of frons sulcate, lower half of head inclined forward, apex pointed. Rostrum, length 2.0 mm, reaching between middle coxae, piceous. Antennae: segment I, length .37 mm, thickness .10 mm, barely reaching apex of clypeus; II, 2.1 mm, tapering from slender at base to subclavate on apical third, thickness .17 mm, clothed with fine yellowish pubescence, reddish brown, fuscous brown on apical third; III, .75 mm, brownish black, thickness about equal to base of segment II; IV, .58 mm, white, scarcely dusky on apex. Pronotum, length 1.22 mm, width at base 1.53 mm; black, disk moderately convex, surface dull, waxlike finish, transversely wrinkled; lateral margins nearly straight, rounded; calli indicated by slightly shining surface; surface of disk with very fine short, yellowish pubescence. Scutellum and mesonotum clothed with appressed, short, sericeous pubescence, with waxlike sheen on surface; black. Hemelytra brownish black, a broad band of frosted sheen across middle, just anterior to the posterior silvery band; with a transverse band of silvery, scale-like hairs across corium at a point opposite apex of scutellum; a posterior transverse narrow band or line of silvery scales, extends clear across hemelytra, crossing apical area of clavus, without interruption. Behind this silvery band the whole width of hemelytra has a shining surface, best seen at certain angles of reflected light; this area bearing very fine, appressed, golden pubescence, and sparsely intermixed with suberect, bristlelike hairs; short bristles more erect on clavus and basal half of corium. Cuneus brownish black, having the same color and shine of the corium behind the posterior silvery line; the paracuneus bearing silvery sericeous patches of

pubescence, which also extend upon inner basal angle of cuneus. Membrane light fuscous, a deeper fuscous cloud or patch covers apical area of larger areole, veins fuscous. Ventral surface brownish black, mesosternum highly polished, epimeron covered with silvery scales; ostiolar peritreme dark brown. Venter strongly shining. Legs dark brown, tibiae lighter, coxae pallid except basal half, front coxae nearly white on anterior aspect; hind tibiae flattened, moderately curved, edges with short spines.

Female. Length 4.8 mm, width 1.7 mm. Head: width 1.3 mm, vertex .64 mm. Antennae: segment I, length .40 mm, thickness .10 mm, yellowish brown; II, 1.39 mm, reddish brown, darker on apical half, thickness .18 mm, more slender at base than segment I; III, .71 mm, brownish black, thickness .08 mm; IV, .58 mm, white. Rostrum, length 2.0 mm, reaching to middle of hind coxae. Pronotum, length .92 mm, width at base 1.46 mm. Color, pubescence and bristles very similar to the male.

Holotype: ♂ Aug. 7, 1925, Stonewall 8,500 ft, near Trinidad, Colorado (H. H. Knight). **Allotype:** ♀ taken with the type on *Pinus ponderosa* by beating. **Paratypes:** 10 ♂ 4 ♀ taken with the types. 5 ♂ 3 ♀ Aug. 20-22, 1925, Pingree Park (H. H. Knight); ♂ ♀ Aug. 15-22, 1924, Pingree Park (Drake & Hottes); 16 ♂ 22 ♀ Aug. 24, 1925, Estes Park (H. H. Knight), taken on *Pinus scopulorum*; 3 ♂ 3 ♀ Aug. 10, 1925, Fort Garland (H. H. Knight), taken on *Pinus edulis*; ♂ ♀ Aug. 14, 1925, Mesa Verde Nat. Park, Colorado (H. H. Knight). 2 ♂ Aug. 9, 1930, San Francisco Mts. (E. D. Ball); ♂ July 28, 1941, McNary (L. L. Stitt); 2 ♂ July 29, 1905, Huachuca Mts., Arizona (H. G. Barber). ♂ Bryce Canyon, Utah (J. Kartchner). 4 ♂ Aug. 15, 1927, Shoshone Nat. Forest, Wyoming (H. H. Knight), taken on *Pinus flexilis*.

Pilophorus microsetosus, new species

Allied to *hesperus* Kngt., but distinguished by the more slender second antennal segment, by the yellowish brown hemelytra and set with microsetae.

Male. Length 4.9 mm, width 1.7 mm. Head: width 1.2 mm, vertex .57 mm; base of vertex forming a sharp and elevated posterior edge, that slightly overlaps anterior margin of pronotum, base of frons and front of vertex broadly sulcate; brownish black. Rostrum, length 1.7 mm, reaching upon apex of middle coxae, dark brown. Antennae: segment I, length .37 mm,

thickness .11 mm, fuscous brown; II, 2.0 mm, subcylindrical, slender at base, tapering gradually thicker (.13 mm) near apex, reddish brown, blackish on apical one-fifth, finely pale pubescent; III, .68 mm, black, pale on base; IV, .58 mm, white. Pronotum, length .85 mm, width at base 1.49 mm; brownish black; disk moderately convex, lateral margins rounded, nearly straight as viewed from above, basal margin broadly sulcate; disk with waxlike finish, slightly granulate, clothed with recumbent, short, simple golden pubescence. Mesosternum and scutellum brownish black, clothed with a very fine, appressed, silvery sericeous pubescence, margins of scutellum bearing somewhat tomentose, silvery sericeous hairs.

Hemelytra yellowish brown as far as the transverse posterior silvery band, behind this the surface shines for full width of corium and apex of clavus, also the cuneus, and clothed with very fine, short pubescence, sparsely intermixed with simple short hairs, a few longer on apex of corium and paracuneus; the clavus and corium sparsely set with short, black microsetae and some short golden hairs intermixed on the yellowish brown area; corium also with the usual tomentose band of silvery hairs, forming a short transverse band near middle of basal half. Membrane and veins fuscous, a darker area covers apex of larger areole and central part of membrane. Mesosternum and the venter brownish black, strongly shining, sides of venter with an oblique band of silvery, sericeous pubescence. Legs brownish black, front coxae with anterior aspect and apices of hind coxae nearly white; posterior tibiae curved and strongly flattened, with black spines along the margins.

Female. Length 4.5 mm, width 1.5 mm. Head: width 1.25 mm, vertex .61 mm. Antennae: segment I, length .37 mm; II, 2.07 mm, slender, tapering thicker (.13 mm) near apex, yellowish brown, apical fourth black; III, .74 mm, black; IV, .54 mm, white. Pronotum, length .85 mm, width at base 1.32 mm. Very similar to the male in form, color and pubescence.

Holotype: ♂ Aug. 24, 1965, Area 12M, Nevada Test Site (J. M. Merino), taken on *Pinus monophylla*. **Allotype:** ♀ same data as the type. **Paratypes:** nymphs June 24, 1965, Area 16M, Nevada Test Site (H. H. Knight & J. M. Merino), taken on *Pinus monophylla* and identified as this species by the antennal characters; 2♂ 3♀ July 3, 1962, Reno, Washoe County, Nevada (F. D. Parker), taken on *Pinus monophylla*. 2♂ 2♀ June 20, 1928, alt. 6200 ft, Chiricahua

Mts. (A. A. Nichol); ♂ ♀ July 19, 1929, Glen Oaks (E. D. Ball); ♂ ♀ Aug. 3, 1917, Grand View, Grand Canyon (H. H. Knight); ♂ July 19, 1929, Tucson, Arizona (E. D. Ball). ♂ ♀ July 14, ♂ Aug. 5, 1931, Mesa (F. C. Hottes); ♂ July 13, 1930, Mesa Verde National Park, Colorado (R. L. Usinger). ♀ Aug. 7, 1927, Shoshone National Forest, Wyoming (H. H. Knight).

Pilophorus jezzardi, new species

Allied to *tibialis* Van D., but easily distinguished by the black antennal segment III, and white segment IV; posterior tibiae not so strongly curved and not as wide.

Male. Length 3.8 mm, width 1.36 mm. Head: width 1.10 mm, vertex .54 mm. Rostrum, length 2.1 mm, reaching middle of hind coxae, dark brown. Antennae: segment I, length .37 mm, yellowish; II, 1.63 mm, slender at base, tapering gradually to thicker (.15 mm) near apex, yellowish on base and reddish brown on apical third, clothed with short yellowish and black pubescent hairs; III, .61 mm, brownish black, thickness equal to segment II near base; IV, .51 mm, white. Pronotum, length .72 mm, width at base 1.10 mm, disk moderately convex, basal margin nearly straight, lateral margins rounded, moderately sulcate; surface with waxlike sheen, coriaceous, clothed with fine, short yellowish pubescence. Mesonotum and scutellum dark brown, scutellum with flat margins, discal area abruptly convex, rising to a plateau on basal half, margins bearing silvery tomentose pubescence. Hemelytra yellowish brown, with nearly straight, transverse posterior silvery line, and behind this, dark brown and shining across the full width, cuneus included; paracuneus bearing scattered tufts of silvery tomentose hairs; pubescence very fine and short, recumbent or appressed, golden yellow hairs, and without bristles; basal half of corium with the usual short, transverse silvery band, which if projected as an imaginary line would barely miss apex of scutellum. Membrane pale fuscous, a darker cloud covers apices of areoles and area just behind, veins fuscous. Ventral surface dark reddish brown, mesosternum polished, venter shining, the latter with the usual oblique patch of silvery, tomentose hairs on the sides. Legs yellowish brown to reddish brown, hind femora somewhat darker; hind tibiae flattened, moderately curved, width equal to two-thirds width of posterior femur.

Female. Length 3.8 mm, width 1.3 mm. Head: width 1.10 mm, vertex .56 mm. Antennae:

segment I, length .34 mm, pale yellowish; II, 1.83 mm, slender on basal third, gradually thicker (.15 mm) on apical half, reddish brown to dark brown on clavate portion; III, .61 mm, black; IV, .48 mm, white. Very similar to the male in form, color and pubescence.

Holotype: ♂ Aug. 10, 1925, Fort Garland, Colorado (H. H. Knight). **Allotype:** ♀ Aug. 7, 1925, Stonewall, alt. 8500 ft, near Trinidad, Colorado (H. H. Knight). **Paratypes:** ♂ 6 ♀ taken with the types on *Pinus edulis*. 2♂ 2♀ July 24, 1900, Salida (E. D. Ball); ♂ Aug. 13, 1925, Durango, Colorado (H. H. Knight).

This species is dedicated to a long time friend, Mr. Paul H. Jezard, an old Missouri resident who has followed my work in entomology with interest and encouragement since we were biology students together in high school.

Pilophorus barberi, new species

Runs in the key to the couplet with *crassipes* Popp., but may be separated by the oblique position of basal silvery band, also by the blackish clavus with abundant, appressed golden hairs.

Female. Length 4.4 mm, width 1.7 mm. Head: width 1.15 mm, vertex .57 mm; black, edges of vertex sharply produced, sulcate just in front, eyes flattened in front to conform with the contour of frons. Rostrum, length 1.7 mm, reaching between middle coxae. Antennae: segment I, length .37 mm, pale fuscous, more pallid beneath; II, 1.73 mm, at base more slender than I, tapering gradually thicker (.136 mm) on apical area, light brown near base and dark brown to black on apical third, clothed with inconspicuous pale pubescence; III, .61 mm, slender, equal to thickness at base of II, brownish black, basal third white; IV, broken, but white on base. Pronotum, length .80 mm, width at base 1.29 mm; basal margin nearly straight, lateral margins rounded, slightly sulcate, disk moderately convex, brownish black, clothed with very short, fine, appressed yellowish pubescence. Mesonotum and scutellum, brownish black, thickly clothed with appressed, silvery, sericeous pubescence, apex and sides of scutellum thickly covered with silvery tomentum. Hemelytra rather uniformly brownish black, corium with a broad silvery tomentose band, that if projected straight across would strike apex of scutellum, but on inner half turns obliquely backward, so it would strike middle of clavus if projected far enough; the posterior band

starts as a transverse band, but upon reaching the clavus is dislocated slightly to the rear for half its width, crosses the clavus, then regains the position of a transverse line; behind this posterior band the surface is moderately shining for the full width, including cuneus and tip of clavus; bristles are absent on dorsal surface, but the clavus and apical area or corium clothed with appressed, golden sericeous pubescence, but very little of the same on basal half of corium; the paracuneus bearing a sizeable patch of silvery tomentum which extends a bit upon inner basal angle of cuneus. Membrane pale fuscous but a sizeable patch covering apex of larger areole brownish black, veins dark. Ventral surface brownish black, sternum and venter highly polished, sides of venter with a wide patch of silvery tomentum, especially on fourth and fifth segments. Legs brownish black, paler on middle and front tibiae, also on part of the coxae.

Holotype: ♀ July 29, 1905, Huachuca Mts., Arizona (H. G. Barber).

This species is named for my old friend, Mr. Harry G. Barber, who for many years was our leading authority for the family Lygaeidae. As a young man he made a collecting expedition to Arizona in 1905, and brought back much valuable material, especially Hemiptera, which has added much to our knowledge of distribution of the species. Many years ago we exchanged Miridae and Lygaeidae for mutual benefit of advancing our studies, and only now have I gotten around to western *Pilophorus* species and a few other genera that need revision.

Pilophorus dislocatus, new species

Allied to *fuscipennis* Kngt., the only known species with posterior silvery band dislocated at the radial vein; distinguished by having second antennal segment thicker than segment I.

Male. Length 3.6 mm, width 1.4 mm. Head: width .98 mm, vertex .47 mm; dark brown, lower half yellowish brown. Antennae: segment I, length .23 mm, yellowish; II, 1.3 mm, cylindrical, tapering to slightly thicker (.11 mm) on apical half, slightly thicker than segment I, yellowish, dark brown on apical half; III, .44 mm, pallid, apical half dark brown; IV, .44 mm, fuscous, pallid on base. Rostrum, length 1.42 mm, reaching upon apex of middle coxae, yellowish brown. Pronotum, length .64 mm, width at base 1.12 mm; disk moderately convex, lateral margins rounded, slightly sulcate as viewed

from above; surface with waxlike shine, bearing very fine, short pubescence. Mesonotum and scutellum brownish black, scutellum with margins flat, disk rising sharply to a convex center, basal angles and apex, each with a patch of silvery, tomentose hairs. Hemelytra yellowish brown, shining areas behind posterior silvery line, the apex of clavus, outer apical area of corium and the cuneus, dark fuscous brown; sparsely clothed with recumbent, simple, golden pubescent hairs, a few longer, erect bristle hairs at apex of corium and on paracuneus; also having the usual short, silvery tomentose band across basal half of corium; and the transverse, silvery, posterior band that cuts across well before apex of clavus, but in this case widely dislocated at the radial vein, the outer portion well behind the transverse central portion of the silvery band; a few silvery spots on the paracuneus. Membrane uniformly pale fuscous, central area somewhat darker, veins fuscous. Ventral surface brownish black, mesosternum and venter polished or highly shining; legs pallid to yellowish, femora darker brown. Venter with an oblique silvery band which extends across segments three to five inclusive; also the epimeron of thorax with silvery line on dorsal margin.

Female. Length 3.7 mm, width 1.3 mm. Head: width 1.20 mm, vertex .54 mm; base of vertex forming a sharp curving edge, eyes also curve back to overlap anterior angles of pronotum. Antennae: segment I, length .27 mm; II, 1.15 mm, slightly thicker (.12 mm) than in the male, yellowish brown, apical half brownish black; III, .44 mm, pallid, apical half black; IV, .47 mm, pallid, apical half fuscous. Rostrum, length 2.2 mm, reaching to middle of hind coxae. Pronotum, length .68 mm, width at base 1.10 mm. Color and pubescence very similar to the male.

Holotype: ♂ Aug. 7, 1925, Stonewall, alt. 8500 ft, near Trinidad, Colorado (H. H. Knight). **Allotype:** ♀ same data as the type. **Paratypes:** 2♂ 7♀ taken with the types while beating on *Pinus ponderosa*. ♂ Sept. 1, 1940, Springer-ville (L. L. Stitt); 2♂ 6♀ July 29, 1905, Huachuca Mts., Arizona (H. G. Barber).

Pilophorus chiricahuac, new species

Allied to *australis* Kngt. by having the posterior silvery line interrupted at the clavus, but may be distinguished by the much broader vertex.

Female. Length 3.7 mm, width 1.36 mm. Head: width .92 mm, vertex .47 mm; vertex al-

most equal to half the width of head; yellowish brown. Antennae: segment I, length .23 mm, brownish yellow; II, 1.29 mm, more slender at base, but gradually thicker (.07 mm) on apical half, just attaining thickness of segment I, reddish brown, apex fuscous; III, broken. Pronotum, length .68 mm, width at base 1.08 mm; basal margin almost straight, lateral margins rounded, moderately sulcate as viewed from above; disk moderately convex, slightly shining, clothed with minute, short yellowish hairs; yellowish brown, basal half of disk fuscous. Mesonotum and scutellum yellowish brown; scutellum with apex and side margins bearing silvery tomentose pubescence. Hemelytra yellowish brown, outer half of corium behind posterior silvery line, tip of clavus and cuneus brownish black, shining; posterior silvery line transverse but dislocated, set forward at the claval suture; basal half of corium with the usual, short, transverse, tomentose band; clothed with minute, appressed, sparsely set, golden yellow pubescent hairs, bristles not present. Membrane fuscous, veins golden brown. Ventral surface yellowish brown, mesosternum polished, without infuscations. Legs yellowish brown, hind femora dark brown; hind tibiae dark brown, not flattened or curved. Venter dark brown, piceous on the sides, clothed with rather long pale hairs.

Holotype: ♀ June 20, 1928, alt. 6200 ft, Chiricahua Mts., Arizona (A. A. Nichol). **Paratype:** ♀ same data as the type.

Pilophorus nevadensis, new species

Resembles *tomentosus* Van D., but may be separated from that species by the dislocated posterior silvery line where it crosses the clavus; dorsal bristles black.

Male. Length 4.2 mm, width 1.5 mm. Head: width 1.10 mm, vertex .58 mm; yellowish brown, vertex infuscated. Rostrum, length 1.49 mm, reaching upon apex of middle coxae, piceous. Antennae: segment I, length .30 mm, thickness .068 mm, pallid to yellowish; II, 1.5 mm, more slender near base, equal in thickness at middle to that of segment I, apical half thicker (.11 mm), yellowish brown, apical half brownish black; III, .57 mm, white, apical half brownish black; IV, .47 mm, white, apical half fuscous. Pronotum, length .75 mm, width at base 1.25 mm; disk moderately convex, basal margin nearly straight, lateral margins rounded, moderately sulcate; surface somewhat coriaceous, with waxlike sheen, thickly clothed with very fine, short, golden pubescent hairs, and sparsely intermixed

with erect bristly hairs. Mesonotum and scutellum dark brown to fuscous, well covered by appressed, silvery, tomentose hairs, more heavily on edges of scutellum, a few bristle hairs intermixed. Hemelytra yellowish brown, basal half of corium with a transverse patch of silvery tomentose hairs; apical area with rather wide transverse silvery band of tomentose hairs, dislocated at the clavus for a space about equal to width of the band; behind this band the apex of clavus, outer half of corium or exterior to radial vein, and cuneus all shining in certain angles of light, also dark brown in color; surface clothed with fine, short, appressed golden pubescent hairs, and sparsely intermixed with erect, short, black bristles, a few paler bristles mixed in. Membrane pale fuscous, a darker smoke brown cloud covers apical area of larger areole, veins brown. Ventral surface dark brown, venter brownish black, mesosternum polished, venter shining but with a waxlike sheen, sides of venter with tomentose white patches. Legs brown, hind pair brownish black, tips of coxae pale; posterior tibiae strongly flattened but nearly straight.

Female. Length 3.9 mm, width 1.5 mm. Head: width 1.12 mm, vertex .61 mm. Antennae: segment I, length .27 mm; II, 1.39 mm, tapering to thicker on apical half, thicker than segment I; III, .54 mm, white, apical half black; IV, .47 mm, white, apical half fuscous. Pronotum, length .78 mm, width at base 1.26 mm. Color, pubescence and bristles very similar to the male.

Holotype: ♂ July 12, 1965, 15 mi east of Wells, Nevada (H. H. Knight). **Allotype:** ♀ same data as the type. **Paratypes:** 5♂ 5♀ taken with the types by beating *Chrysothamnus*.

Pilophorus salicis, new species

Allied to *nevadensis* Kngt., but distinguished by the slender second antennal segment which is subequal in thickness to segment I.

Male. Length 4.1 mm, width 1.3 mm. Head: width .98 mm, vertex .47 mm; dusky brown. Rostrum, length 1.49 mm, reaching upon apex of middle coxae. Antennae: segment I, length .30 mm, thickness .09 mm, pallid to yellowish; II, 1.43 mm, cylindrical, slightly more slender at base, thickness .10 mm, subequal to segment I, reddish brown, apex infuscated; III, .58 mm, white, apex fuscous; IV .51 mm, fuscous, pallid on base. Pronotum, length .71 mm, width at base 1.18 mm; yellowish brown, disk moderately convex, basal margin just slightly sinuate, lateral margins rounded, sulcate as viewed from above,

finely coriaceous, clothed with short, appressed and recumbent pale pubescence, sparsely interspersed with a few erect, bristle hairs. Mesonotum and scutellum yellowish brown, clothed with appressed yellowish and silvery, tomentose hairs; scutellum convex on middle and base, set with a few yellowish bristles. Hemelytra yellowish brown, corium with a short, transverse, silvery tomentose band about opposite apex of clavus; with a posterior, transverse silvery band that is dislocated at clavus for a space just equal to width of band; corium behind this band and exterior to radial vein, the cuneus and apex of clavus, dark brown with surface shining; paracuneus largely covered with silvery tomentose hairs; clothed with minute, appressed, sericeous golden hairs, the whole sparsely set with erect, short yellowish bristles, many easily rubbed off in collecting. Membrane pale fuscous, central area and veins definitely brown as viewed in certain angles of light. Ventral surface yellowish brown, mesosternum polished, venter shining, pale pubescent, sides of segments three to six with a wide patch of appressed silvery sericeous pubescence. Legs light brown to reddish brown, coxae largely pallid; hind tibiae straight, only slightly flattened.

Female. Length 3.7 mm, width 1.5 mm. Head: width 1.02 mm, vertex .54 mm. Antennae: segment I, length .30 mm; II, 1.43 mm, slightly thicker on apical half, subequal to thickness of segment I; III, .61 mm, white, apical half fuscous; IV, .48 mm, pale, apex fuscous. Pronotum, length .71 mm, width at base 1.19 mm. Color, form of antennae, pubescence and bristles very similar to the male.

Holotype: ♂ Aug. 6, 1925, Los Animas, Colorado (H. H. Knight). **Allotype:** ♀ taken with the type. **Paratypes:** 7♂ 3♀ taken with the types on sage willow, *Salix*. ♂ ♀ Aug. 19, 1898, Dixon's Canyon, Fort Collins (E. D. Ball); ♂ ♀ June 25, 1900, Fort Collins (E. D. Ball); ♀ June 16, 1900, Rocky Ford, Colorado (E. D. Ball). ♂ ♀, "Colo." ♂ ♀ June 7, 1966, Verdi, Washoe County, Nevada (W. Gagné).

Pilophorus tanneri, new species

Allied to *longisetosus* Kngt., but differs in the longer second antennal segment; also differs in having shorter bristles which in length do not exceed diameter of antennal segment II.

Male. Length 4.3 mm, width 1.5 mm. Head: width 1.10 mm, vertex .50 mm; yellowish brown, vertex and front fuscous to black. Rostrum, length 1.53 mm, reaching upon apex of middle

coxae, brown. Antennae: segment I, length .34 mm, pale to yellowish; II, 1.7 mm, cylindrical, more slender on base, but apical half thicker, slightly thicker than segment I, length slightly greater than distance between base of pronotum and apex of clypeus, reddish brown, apex fuscous; III, .60 mm, white, apical half fuscous; IV, .54 mm, fuscous, pallid on base. Pronotum, length .81 mm, width at base 1.32 mm; black, disk moderately convex, basal margin sinuate on middle, curving forward at basal angles, lateral margins rounded, slightly sulcate as viewed from above; disk clothed with very fine, short, appressed golden pubescent hairs, sparsely intermixed with short, erect, bristle hairs, surface with waxlike sheen. Mesonotum and scutellum black, clothed with appressed, silvery sericeous hairs, more thickly on flat margins and basal angles of scutellum, convex disk with several setose hairs. Hemelytra yellowish brown, corium with a short transverse, silvery, tomentose band at a point just opposite apex of scutellum; also having a posterior transverse silvery band that is dislocated at clavus for a space just equal to width of band; corium behind this band and exterior to radial vein, the cuneus and apex of clavus, darker brown and with surface shining under proper angle of light; paracuneus covered with silvery, tomentose hairs, some hairs running over upon inner basal angle of cuneus; yellow brown areas clothed with minute, appressed, sericeous golden pubescent hairs, the whole area sparsely set with erect, short yellowish bristles, many easily shed when collecting specimens if not before; length of bristles on corium less than diameter of antennal segment II. Membrane pale fuscous brown, a large deeper brown spot covers apex of larger areole and beyond, veins golden brown. Ventral surface brown to dark brown, venter brown to brownish black, shining, sides of segments three to five broadly covered with an oblique area of silvery, tomentose hairs. Legs yellowish brown, coxae half pallid; posterior tibiae nearly straight, only slightly compressed.

Female. Length 4.0 mm, width 1.46 mm. Head: width 1.10 mm, vertex .58 mm, cylindrical, more slender at base than segment I, but gradually tapering to thicker (.12 mm) near apex; III, white, apical half fuscous. Pronotum, length .71 mm, width at base 1.12 mm. More robust than the male but very similar in color and pubescence.

Holotype: ♂ Aug. 15, 1929, Richfield, Utah (E. W. Davis), at light trap. **Allotype:** ♀, Parowan, Utah (V. M. Tanner).

Named to honor Dr. Vasco M. Tanner, long-time entomologist at Brigham Young University, and well known authority with the Coleoptera.

Pilophorus longisetosus, new species

Allied to *tanneri* Kngt., but distinguished by the shorter second antennal segment, also by the long erect bristles on the hemelytra.

Female. Length 3.7 mm, width 1.3 mm. Head: width .92 mm, vertex .44 mm; frons broadly rounded, convex, thickly set with erect bristles, basal margin of vertex sharp, only slightly elevated; basal margin forming an arc with posterior margin of eyes to fit snugly against pronotum, yellowish brown, frons and vertex blackish. Rostrum, length 1.36 mm, reaching between middle coxae. Antennae: segment I, length .27 mm, thickness .07 mm, pale to yellowish; II, 1.19 mm, slender on basal half, tapering to thicker (.10 mm), yellowish brown, apical area dark brown; III, .45 mm, white, apical half fuscous; IV, .41 mm, fuscous, white on base. Pronotum, length .68 mm, width at base .98 mm; disk rather strongly convex, basal margin nearly straight, lateral margins rounded, strongly sulcate as viewed from above; disk brownish black, surface with waxlike sheen, clothed with very fine, short, appressed copper colored pubescence, sparsely intermixed with rather long, erect, yellowish bristle hairs. Mesonotum and scutellum brownish black, thickly covered with appressed, yellowish, pubescent hairs, a thick spot of silvery, tomentose flat hairs covering basal angles of scutellum and extending forward upon mesonotum. Hemelytra yellowish brown, corium with a short, transverse, silvery tomentose band at a point nearly opposite the extreme apex of scutellum; corium also with the usual posterior, transverse, silvery tomentose band that in this case is completely detached from the band across apical area of clavus, thus widely dislocated at the claval suture; corium behind this posterior band and exterior to radial vein, the cuneus and apex of clavus, dark brown and with surface shining under proper angles of light; paracuneus well covered with silvery, tomentose hairs, some hairs extending well across base of cuneus; the yellowish brown areas of hemelytra sparsely set with erect, long bristle-type hairs, the length of which greatly exceed thickness of second antennal segment. Membrane pale dusky brown, central area and veins yellowish brown. Mesosternum brownish black, shining; legs yellowish brown, coxae pallid, posterior tibiae straight, not flattened. Venter dark

brown, polished, having strong simple pubescent hairs, a patch of silvery tomentose hairs on sides of segments three to five.

Holotype: ♀ Aug. 2, 1900, Colorado Springs, Colorado (E. D. Ball).

Pilophorus merinoi, new species

Runs in the key close to *exiguus* Popp., from which it may be separated by the transverse position of basal silvery band on the corium.

Female. Length 3.6 mm, width 1.25 mm. Head: width .98 mm, vertex .46 mm; basal edge of vertex sharp, slopes nearly vertically forward to frons, posterior edge forms an arc with posterior margin of eyes to fit closely against anterior angles of pronotum. Rostrum, length 1.7 mm, reaching between posterior coxae, dark brown. Antennae: segment I, length .25 mm, thickness .10 mm, dusky yellow with a touch of reddish; II, 1.3 mm, more slender on basal half, but tapering thicker (.12 mm) on apical third, black, basal half yellowish to fuscous; III, .54 mm, pallid, apical half fuscous; IV, .47 mm, fuscous, base pallid. Pronotum, length .71 mm, width at base .92 mm; disk moderately convex, slopes rapidly to each side to join the strongly rounded and sulcate lateral margins, basal margin nearly straight. Mesonotum broadly exposed, joining base of scutellum without definite demarcation; clothed with fine sericeous pubescence, a longitudinal tomentose band covering basal angles of scutellum, convex disk with minute pubescence only. Hemelytra pale fuscous, darker on base of clavus; clothed with minute pubescence and sparsely interspersed with longer, yellowish, recumbent pubescent hairs; basal half of corium with a strong, transverse, silvery tomentose band; posterior silvery band narrower, crosses the clavus without interruption, but sloping slightly in posterior direction; behind this posterior band, the apex of clavus, corium exterior to radial vein, and the cuneus, brownish black and shining under proper angles of light; paracuneus covered with tomentose silvery patches. Membrane fumate, having an opaque brownish black cloud covering areoles and central area of membrane. Ventral surface brownish black, mesosternum polished, venter shining, covered with recumbent pale pubescence, sides of segments three and four with an oblique patch of silvery, tomentose hairs. Legs dark brown, apical half of hind coxae, and anterior aspect of front coxae, pallid; tibiae paler brown, posterior tibiae straight, not visibly compressed.

Male. Length 3.5 mm, width 1.2 mm. We have one teneral male specimen which is not perfect for description. Antennal segment II dried in a flattened condition, would appear to be more gradually thickened from middle to apex. Hemelytra deep fuscous brown in color, not at all translucent.

Holotype: ♀ June 24, 1965, Area 16M, Nevada Test Site (H. H. Knight & J. M. Merino). **Paratype:** ♂ June 19, 1965, Area 401M, Nevada Test Site (H. H. Knight & J. M. Merino). Nymphs were taken with the adults, all on *Pinus monophylla*. 2 ♀ July 25, 1962, Area 12M, Nevada Test Site.

This species is dedicated to Joe M. Merino who helped collect this material, served as guide, chauffer and assistant with the author in the collecting project at the test site.

Pilophorus utahensis, new species

Runs in the key to near *discretus* Van D. from which it may be separated by the brownish black color; hind tibiae more strongly curved.

Male. Length 3.4 mm, width 1.26 mm. Head: width .88 mm, vertex .48 mm; frons dark brown. Rostrum, length 1.39 mm, reaching to middle of hind coxae, dark brown. Antennae: segment I, length .27 mm, fuscous brown; II, 1.11 mm, cylindrical, slender, not attaining thickness of segment I, reddish brown to brownish black, pubescence minute, scarcely visible; III, broken. Pronotum, length .68 mm, width at base .95 mm; disk moderately convex, basal margin sulcate on middle, lateral margins rounded, sulcate as viewed from above, mahogany brown or brownish black, shining, minutely pubescent. Mesonotum and scutellum mahogany brown; scutellum moderately convex, transversely rugulose on the elevated discal area, basal angles and apex with silvery tomentose pubescence. Hemelytra medium brown; basal half of corium with a thick transverse band of silvery, tomentose hairs, placed at a point opposite apex of scutellum; apical area of corium with a nearly transverse band of silvery, tomentose hairs, which angles somewhat obliquely forward to meet clavus, which is crossed without dislocation of the band; corium behind the silvery band and exterior to radial vein, apex of the clavus, and the cuneus, dark brown and with surface shining under proper angles of light; paracuneus bearing silvery tomentose hairs which may invade base of cuneus; the whole surface bearing minute and some recumbent, golden pubescent

hairs, but without strong bristles. Membrane pale fuscous, but with a cloud spot of brown shading central area, areoles and veins. Ventral surface dark brown, mesosternum polished; venter brownish black, shining, with the usual patches of silvery tomentose hairs on sides of segments three to five inclusive. Legs brown to reddish brown, coxae reddish brown, basal half of front coxae and apices of hind coxae, pallid or white.

Female. Length 3.4 mm, width 1.15 mm. Head: width .88 mm, vertex .47 mm, vertex impressed just before sharp basal edge. Antennae: segment I, length .24 mm, yellowish brown; II, 1.25 mm, cylindrical, slightly thicker on apical half but scarcely attaining thickness of segment I, brown to reddish brown and black. Pronotum, length .64 mm, width at base .95 mm, sides sharply sulcate just before basal angles. Very similar to the male in form, color and pubescence.

Holotype: ♂ Oct. 12, 1932, Leeds, Utah (E. W. Davis). **Allotype:** ♀ same data as the type. **Paratypes** 10♂ ♀ taken with the types, 5♂ 3♀ July 28, 1900, Grand Junction, Colorado (E. D. Ball).

Pilophorus balli, new species

In the key this species runs in the couplet with *tomentosus* Van D. but differs at least in lacking sericeous pubescence.

Male. Length 3.0 mm, width 1.3 mm. Head: width .85 mm, vertex .51 mm; yellowish brown, frons and vertex well covered with erect yellowish bristles. Rostrum, length 1.38 mm, reaching to middle of hind coxae, brown. Antennae: segment I, length .20 mm, pallid; II, 1.02 mm, cylindrical, slender, slightly thicker on apex but scarcely attaining thickness of segment I, yellowish, reddish brown toward apex, pubescence minute; III, .64 mm, yellowish, apex fuscous; IV, .44 mm, pallid, apex fuscous. Pronotum, length .64 mm, width at base 1.05 mm; yellowish brown, shining, disk moderately convex, basal margin slightly sinuate, lateral margin just slightly sulcate; disk set with numerous, erect,

yellowish bristle hairs, intermixed with some minute pubescent hairs. Mesonotum and scutellum yellowish brown, minutely pubescent, scutellum moderately convex on disk, base transversely rugulose, with a few erect bristle hairs, basal angles and flat apex with silvery tomentose hairs. Hemelytra uniformly yellowish brown, basal half of corium with thick transverse band of silvery tomentose hairs, having a slight curve so that if projected transversely would pass slightly behind tip of scutellum; apical area of corium with transverse silvery band of tomentose hairs, which crosses apical area of clavus without interruption; corium behind this band and exterior to radial vein, the cuneus and apex of clavus, darker brown and with surface shining under proper angles of light; paracuneus covered with silvery tomentose hairs and extend over upon basal angle of cuneus; the whole surface sparsely set with erect yellowish bristle hairs, and in between may be detected spots of minute appressed yellowish hairs. Ventral surface slightly darker reddish brown, mesosternum polished, venter shining, clothed with rather long pubescent hairs; sides of segments three, four and five with patch of silvery tomentose hair. Legs reddish brown; posterior tibiae straight, only slightly flattened.

Female. Length 3.3 mm, width 1.4 mm. Head: width .88 mm, vertex .51 mm. Antennae: segment I, length .23 mm, yellowish; II, 1.02 mm, cylindrical, slightly thicker on apical half but scarcely equal to thickness of segment I, reddish brown; III, broken. Pronotum, length .68 mm, width at base 1.10 mm; lateral margins sulcate. Color, pubescence and bristles very similar to the male.

Holotype: ♂ July 28, 1900, Grand Junction, Colorado (E. D. Ball). **Allotype:** ♀ same data as the type. **Paratypes:** 2♂ 1♀ taken with the types. ♂ Sept. 10, 1901, Fort Collins, Colorado (E. D. Ball).

Named for the collector, Dr. E. D. Ball, who was well known for his work on Homoptera, especially Cixiellidae and Membracidae.

Subfamily MIRINAE

Key to the Tribes

- | | |
|--|---|
| 1. First segment of hind tarsi long as or longer than second and third segments taken together | 2 |
| First segment of hind tarsi not as long as second and third taken together | 3 |

- 2. Myrmecomorphic species; cuneus and membrane vestigial or absent PITHANINI, p. 177
- Species not myrmecomorphic; hemelytra divided into corium, clavus and embolium, cuneus and membrane present STENODEMINI, p. 177
- 3. Ostiolar peritreme small, its dorsal margin scarcely extending dorsad as far as ventral margin of mesepimeron BESTHENINI, p. 181
- Ostiolar peritreme prominent, its dorsal margin extending well above ventral margin of mesepimeron MIRINI, p. 182

Tribe PITHANINI

Key to the Genera

- 1. Length of first antennal segment less than width of vertex .. *Pithanus* Fieb., p. 177
- Length of first antennal segment greater than width of vertex *Mimoceps* Uhler, p. 177

Genus *Mimoceps* Uhler

Mimoceps insignis Uhler

Fig. 242

Mimoceps insignis Uhler, 1890:84.
Mimoceps insignis Knight, 1941:125, Fig. 142.
Mimoceps insignis Carvalho, 1958:277.

This species is known from Colorado, Utah, Idaho, Montana, Wyoming, and New Mexico.

Genus *Pithanus* Fieber

Pithanus maerkeli Herrich-Schaeffer

Fig. 26

Pithanus maerkeli Herrich-Schaeffer, 1838:78, Fig. 406.
Pithanus maerkeli Fieber, 1861:239.
Pithanus maerkeli Knight, 1941:19, 125.
Pithanus maerkeli Carvalho, 1959:279, cat.

This is a European species that has become established widely in North America. It is now known from British Columbia, Washington, Oregon, and several northeastern states.

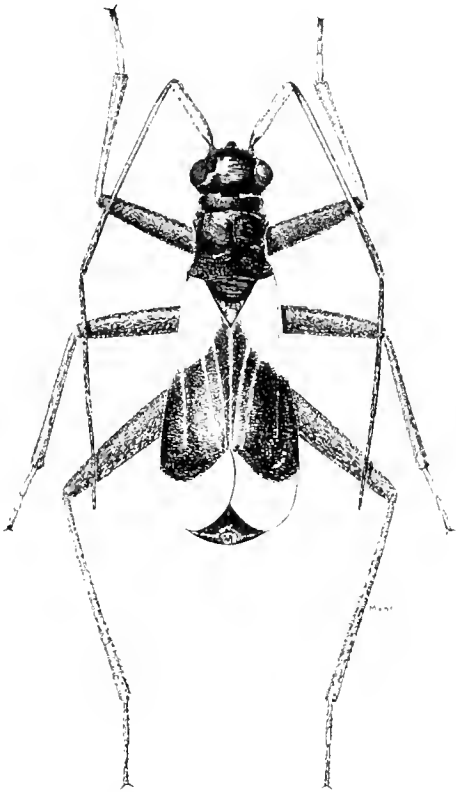


Fig. 242. *Mimoceps insignis* Uhler, brachypterous ♀.

Tribe STENODEMINI

Key to the Genera

- 1. Pronotum distinctly punctate 2
- Pronotum impunctate or rugulose 4

- 2. First antennal segment long and slender, length exceeding width of head plus width of an eye 3
First antennal segment shorter, not or only slightly exceeding width of head; thickly clothed with long suberect hairs *Stenodema*, Lap., p. 178
- 3. Frons and vertex impunctate, smooth *Litomiris* Slater, p. 178
Frons and vertex punctate *Porpomiris* Berg, p. 179
- 4. First antennal segment clothed with erect bristles or long pilose hairs 5
First antennal segment clothed with very short pubescence or bristles 6
- 5. First antennal segment clothed with erect, long pilose hairs; calli with foveate depression on middle of each callus *Chaetofoveolocoris*, n. gen., p. 179
First antennal segment clothed with suberect stiff bristles; calli without fovea *Leptopterna* Fieb., p. 180
- 6. Head short and greatly flattened, front scarcely protruding beyond bases of antennae; first antennal segment slender and curved, thickest near base, tapering to become slender at middle, then becoming slightly enlarged at apex *Teratocoris* Fieb., p. 179
Head long and pointed, front projecting sharply beyond bases of antennae; first antennal segment not formed as above 7
- 7. First antennal segment very long, length exceeding width of pronotum at base; clothed with very short bristles *Megaloceraca* Fieb., p. 180
First antennal segment rather short, length much less than width of pronotum; clothed with very fine short pubescence *Trigonotylus* Fieb., p. 179

Genus *Stenodema* Laporte
Stenodema virens (Linnaeus)

Cimex virens Linnaeus, 1767:730.
Miris virens Fabricius, 1794:185.
Stenodema virens Laporte, 1832:40.
Stenodema virens Van Duzee, 1917:304, cat.
Stenodema virens Knight, 1922:288 (1921).
Record for the Nevada Test Site: Area 12M,
6♂ 7♀, nymphs, Aug. 13, 1965 (J. M. Merino),
taken on *Elymus cinereus*.

Known distribution: Utah, Colorado, Idaho, and Montana. I have compared my material with specimens of *virens* (Linn.) from Finland and Germany and am unable to separate the specimens into two species. These specimens of *virens* differ from material I call *vicinum* (Prov.) from New York and Minnesota, by the shorter first antennal segment; length of segment 1 less than (♀), to subequal (♂), to width of head; hairs on segment 1 longer and more erect than in *vicinum*.

Genus *Litomiris* Slater
Key to the Species

- 1. Cuneus red, outer half pallid 2
Cuneus not red 3
- 2. Rostrum reaching upon fourth ventral segment; length 5.6 mm .. *punctatus* Kngt.
Rostrum just reaching apex of hind coxae; length 6.4 mm *rubicundus* Uhler

3. Length of first antennal segment greater than width of pronotum at base; length 7.4 mm *gracilis* Van D.
Length of first antennal segment less than width of pronotum at base 4
4. Length of first antennal segment plus width of segment 1, subequal to width of pronotum at base; length 8.4 mm *curtus* Kngt.
Length of first antennal segment plus width of vertex subequal to width of pronotum at base; length 8.0 mm *debilis* Uhler

Litomiris debilis (Uhler)

Megaloceroea debilis Uhler, 1872:403.
Litomiris debilis Slater, 1956:119.
This species was taken in Ormsby County, Nevada, in July 1900 (C. F. Baker). It was also taken July 2, 1945, Sheldon Antelope Refuge, Nevada. I have other specimens from Idaho, Montana, Colorado, Wyoming, South Dakota, and Iowa.

Litomiris gracilis (Van Duzee)

Stenodema gracilis Van Duzee, 1914:25.
Megaloceroea gracilis Van Duzee, 1917:306.
Litomiris gracilis Slater, 1956:120.
This species was described from southern California and may well occur in Nevada.

Litomiris rubicundus (Uhler)

Megaloceroea rubicunda Uhler, 1872:409.
Megaloceroea rubicunda Knight, 1928:251.
Known from Arizona, Colorado, New Mexico and Texas.

Litomiris punctatus (Knight)

Megaloceroea punctata Knight, 1928:249.
Litomiris punctatus Slater, 1956:119.
Known at present from Nogales and Santa Cruz Counties, Arizona.

Litomiris curtus (Knight)

Megaloceroea curta Knight, 1928:247.
Known from Idaho, Montana, Wyoming, and South Dakota.

Genus *Porpomiris* Berg

Porpomiris curtulus (Reuter)

Mesomiris curtulus Reuter, 1909:5.
Mesomiris curtulus Van Duzee, 1917:306, cat.
Mesomiris curtulus Knight, 1927:41, host.
Mesomiris curtulus Knight, 1941:131.
Porpomiris curtulus Carvalho, 1952:85.

Known distribution: Colorado, Utah, Nebraska, Maryland, New Jersey, and Long Island, New York.

The species was found breeding on *Panicum huachucae* at Wray, Colorado.

Genus *Teratocoris* Fieber

Teratocoris discolor Uhler
Fig. 244

Teratocoris discolor Uhler, 1877:68, n. sp.
Teratocoris discolor Knight, 1941:128, Fig. 145.

Known distribution: Colorado, Utah, South Dakota, Minnesota, Iowa, Illinois and eastward. Nevada record: ♀ June 17, 1966, Gerlach, Washoe County (W. Gagne). This species occurs on *Scirpus* and *Carex*.

Teratocoris saundersi D. & S.

Teratocoris saundersi Douglas & Scott, 1869:260.
Teratocoris longicornis Uhler, 1895:29, n. sp.
Teratocoris saundersi Van Duzee, 1917:308, cat.
Teratocoris saundersi Carvalho, 1959:311.

Known distribution: Colorado, Wyoming, and Alaska in the U.S.A., and from Manitoba, Canada, and Finland in Europe.

Genus *Trigonotylus* Fieber

Trigonotylus americanus Carvalho

Trigonotylus americanus Carvalho, 1957:125, 126.

Record for the Nevada Test Site: Area 19M, ♀ ♂ June 23, 1965 (H. H. Knight & J. M. Merino). The two specimens were swept up in the net from sparsely growing grasses. This was at a higher elevation than the desert lowland in the Pinyon-Juniper Community. Repeated sweeping failed to turn up additional specimens.

Chaetofoveolocoris, new genus

Allied to *Leptopterna* Fieb. but distinguished by having a foveate depression on middle of each callus; also a pair of foveate punctures

between the calli, narrowly separated by the longitudinal median line. First antennal segment, legs and dorsal surface clothed with long, erect, pilose hairs. Apex or anterior margin of frons abruptly elevated above base of clypeus. Length of first antennal segment (43 units) almost equal to basal width of pronotum (45 units). Body form very slender, hemelytra with costal margins nearly parallel, width at middle nearly subequal to basal width of pronotum. Claws with pseudarolia, arolia erect, thicker at middle, diverging on apical half, typical of the *Stenodemini*. Type of the genus: *Megaloceraca hirsuta* Knight.

Chaetofoveolocatoris hirsuta (Knight)

Megaloceraca hirsuta Knight, 1928:248.

Known distribution: Santa Rita Mts., Pima County, Arizona. Fort Davis Mts., Texas.

Genus *Megaloceraca* Fieber

Megaloceraca recticornis (Geoffroy)

Cimex recticornis Geoffroy, 1785:209.

Megaloceraca longicornis Fieber, 1861:243.

Megaloceraca recticornis Reuter, 1888:15, synonymy.

Megaloceraca recticornis Knight, 1922:286, distr.

Megaloceraca recticornis Knight, 1941:125.

Megaloceraca recticornis Carvalho, 1959:294, cat.

Megaloceraca recticornis Slater, 1956:116.

This is an old European species that was first recognized in America by Knight (1922), which has spread across Canada and the United States. It is known to occur in Idaho, Oregon, Washington, British Columbia, and most of the northern United States and Canada.

Genus *Leptopterna* Fieber

Key to the Species

1. Length of antennal segment I approximately subequal to width of head across eyes; antennal segment II cylindrical, of uniform thickness, set with erect bristles *dolabrata* (Linn.)

Length of antennal segment I greater than width of head across eyes; thickness of antennal segment II greater on basal half, more thickly set with erect bristles *ferrugata* (Fall.)

Leptopterna dolabrata (Linn.)

Fig. 243

Cimex dolabratus Linnaeus, 1758:730.

Miris dolabratus Fabricius, 1803:252.

Leptopterna dolabrata Fieber, 1861:245.

Miris dolabratus Fabricius, 1803:252.

Leptopterna dolabrata China, 1943:262.

Common in the eastern United States and ranges westward to eastern Colorado, and once collected at Fort Wingate, New Mexico. As yet I have not seen specimens taken west of Colorado.

Since the eggs of this species pass the winter in stems of forage plants, the shipments of hay for livestock feeding may distribute the species into new areas. I dare to suggest that finding *dolabrata* at Fort Wingate, New Mexico, stems from shipments of hay to feed horses and mules kept there by the U. S. Army many years ago.

Leptopterna ferrugata (Fallen)

Miris ferrugatus Fallen, 1807:107.

Leptopterna amoena Uhler, 1872:409, n. sp.

Miris ferrugatus Van Duzee, 1917:302.

Miris ferrugatus Knight, 1921:112, distr.

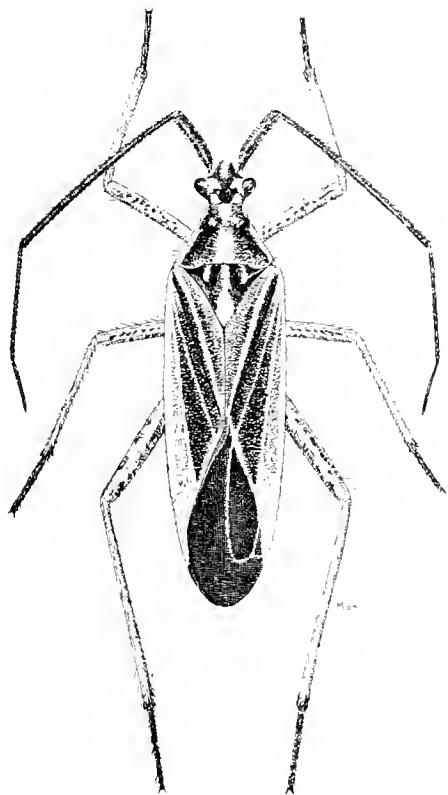
Leptopterna ferrugata China, 1943:262.

This holarctic species is known from Alaska, Canada and the western United States. Records: ♂ July 1900, Ormsby County, Nevada (C. F. Baker). 2♂ July 13, 1965, Coalville, Utah (H. H. Knight). 3♂ May 30, 1936; 5♂ 2♀ June 20, 1932, Moscow, Idaho (T. A. Brindley). 2♂ 1♀ Aug. 1913, Beaver Creek, alt. 6300 ft, Montana (S. J. Hunter). ♂ ♀ May 11-17, Corvallis, Oregon (H. A. Scullen). ♂ June 17, 1927, Puyallup, Washington (W. W. Baker). 2♂ 1♀ Aug. 12, 1925, Wolf Creek Pass, Colorado (H. H. Knight). 2♂ 3♀ Aug. 13, 1922, Grand Marais, Minnesota (H. H. Knight).

Tribe RESTHENINI

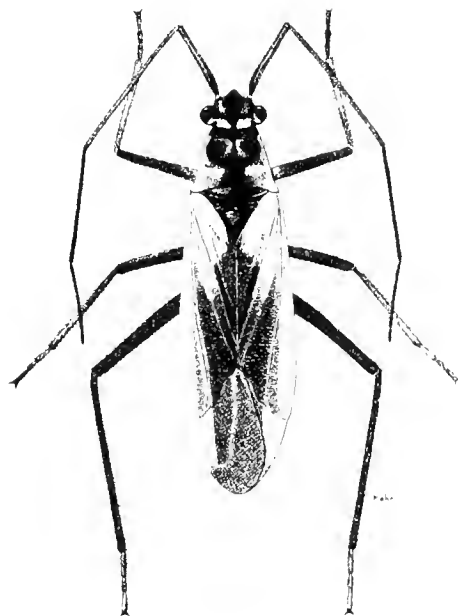
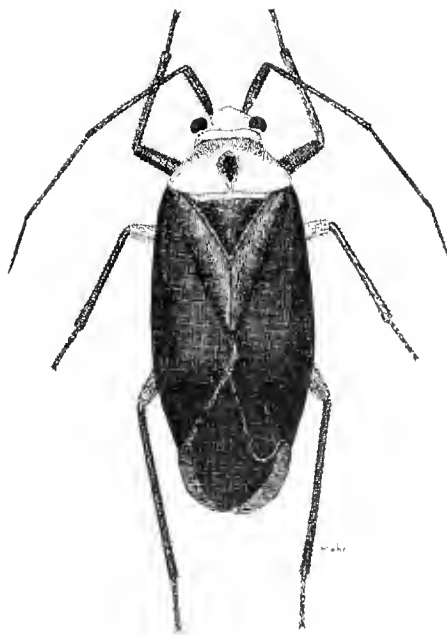
Key to the Genera

1. Length of first antennal segment not equal to width of vertex
 *Oncrometopus* Reuter, p. 182
- Length of first antennal segment greater than width of vertex
 *Prepops* Reuter, p. 181

Fig. 243. *Leptopterna dolabrata* (Linn.), ♂.Genus *Prepops* Reuter*Prepops bivittis* (Stal)*Resthenia bivittis* Stal, 1862:318.*Platytyellus bivittis* Van Duzee, 1917:311.*Prepops bivittis* Carvalho, 1959:332, cat.

Records: ♂ June 24, 1966, Lehman Caves Nat. Monument, White Pine County (W. Gagne); ♀ July 7, 1966, 8 mi W Lide, alt. 6800 ft, Esmeralda County, Nevada (C. W. O'Brien). ♂ ♀ Feb. 14, 1935, Whittier, California (E. L. Paddock), taken on *Galium angustifolia*. This genus of plants is reported from the test site (Beatley, 1965), so I expect the species will be found there.

This wide ranging species is known from Utah, Colorado, Idaho, Montana, Wyoming, British Columbia, California, and Mexico.

Fig. 244. *Tetratocoris discolor* Uhl., ♀.Fig. 245. *Prepops fraternus* (Kngt.), ♀.

Prepops rubrovittatus (Stal)

Resthenia rubrovittatus Stal, 1862:318.
Platytylhellus rubrovittatus Van Duzee, 1917:311.
Prepops rubrovittatus Carvalho, 1959:341, cat.
This species is known from Arizona to Texas.

Prepops rubroscutellatus (Knight)

Platytylhellus rubroscutellatus Knight, 1929:191.
This species is known from Arizona, Colorado, and New Mexico.

Prepops atripennis (Reuter)

Resthenia atripennis Reuter, 1876:65.
Platytylhellus atripennis Van Duzee, 1917:310.
Prepops atripennis Carvalho, 1959:332.
Records: ♀ Sept. 13, 1925, Oracle; 3 ♂ June 7, 1926, Tucson, Arizona (A. A. Nichol). ♀ July 1, 1961, Mt. Springs Summit, Clark County, alt. 5400 ft, Nevada (F. D. Parker). ♀ Zion National Park, Utah (V. M. Tanner). With this distribution it is possible that the species may be found at the test site.

Genus *Oncerometopus* Reuter

Oncerometopus nigriclavus Reuter

Oncerometopus nigriclavus Reuter, 1876:66.
This species is known from California, several localities in Arizona, Colorado, New Mexico, Oklahoma, and Texas. New records: 5 ♀ Sept. 30, 1960, Bristol Wells, Lincoln County, Nevada (R. C. Bechtel), on *Chrysothamnus nauseosus leiosperma*. 3 ♀ May 25, 1935, Cabazon, California (E. L. Paddock), taken on *Encelia farinosa*. A member of the same genus, *Encelia virginensis*, is reported from the test site (Beatley, 1965).

Oncerometopus nicholi Knight

Oncerometopus nicholi Knight, 1928:190.
This species is known from the Kaibab Forest, northern Arizona (Tanner); also I have specimens from Dolores and Mancos, Colorado (Drake & Knight).

Oncerometopus californicus Van Duzee

Oncerometopus californicus Van Duzee, 1918:280.
This species was described from Riverside County, California.

Tribe MIRINI

Key to the Genera

- 1. Pronotum punctate, or strongly rugulose 2
Pronotum smooth, not punctate or strongly rugulose 13
- 2. Antennal segment II clavate, thicker than segment I 3
Antennal segment II not clavate 6
- 3. Antennal segment II slender on basal half, abruptly clavate on apical fourth, length greater than twice the width of head *Ectopiocerus* Uhler, p. 205
Antennal segment II gradually thickened from basal half to apex, length not equal to twice the width of head 4
- 4. Black, juga abruptly convex *Capsus* Fabr., p. 186
Body not black, juga not abruptly convex 5
- 5. Antennal segment II equal to or greater in length than width of pronotum at base *Notholopus* Bergr., p. 205
Antennal segment II rather short, length not equal to width of pronotum at base *Pycnocoris* Van D., p. 205
- 6. Vertex with a longitudinal groove on median line *Creontiades* Dist., p. 204
Vertex without a longitudinal groove 7

7. Black species, with jugum separated from lorum by a deep suture
..... *Irbisia* Reut., p. 185
Species if black, without the deep suture between jugum and lorum 8
8. Pronotum impunctate between calli and posterior to the collar 9
Pronotum punctate between calli and posterior to collar
..... *Tropidosteptes* Uhler, p. 186
9. Dorsal surface distinctly pubescent 10
Dorsal surface shining, glabrous or nearly so; hemelytra translucent
..... *Platylygus* Van D., p. 192
10. Pronotum rugose punctate, lateral margins rounded, not angulate
..... *Lygidea* Reut., p. 187
Pronotum punctate, not clearly rugose, lateral margins angulate 11
11. Antennal segment II long, at least four times the length of segment I; vertex
sharp, forming a straight transverse line posteriorly
..... *Pinalitus* Kelton, p. 187
Second antennal segment shorter 12
12. Pronotum distinctly and densely punctate, pubescent hairs suberect, thickly set
like the punctures; male claspers distinctive *Orthops* Fieb., p. 189
Pronotum more sparsely and shallowly punctate; pubescent hairs shorter and
more recumbent; male claspers distinctive in type *Lygus* Hahn, p. 189
13. First antennal segment distinctly flat, width equal to three or four times the
thickness *Lampethusa* Dist., p. 206
First antennal segment not flat, or width not over twice the thin diameter 14
14. First antennal segment thickened, clothed with numerous flattened hairs
..... *Neurocolpus* Reut., p. 206
First antennal segment devoid of flattened hairs 15
15. Pronotum with two subexcavated, dull, black spots, one behind each callosity;
first antennal segment with long black hairs and setae .. *Taedia* Dist., p. 205
Pronotum without the subexcavated black spots 16
16. Pronotum with lateral margins rounded, without angulate margin 17
Pronotum with definite or angulated margins 20
17. Basal margin of pronotum with a sharp or angulate projection on median line
..... *Dacerla* Signoret, p. 205
Basal margin of pronotum without sharp projection on median line 18
18. Scutellum strongly elevated into a rounded convex disk
..... *Cyphopelta* Van D., p. 205
Scutellum normal, not strongly elevated 19

19. Collar narrow, width not equal to thickness of antennal segment I; shape of head resembles *Adelphocoris* *Stittocapsus* Kngt., p. 205
 Collar flat, dorsal width greater than thickness of antennal segment I; head inclined forward, much like *Cyphopelta* *Clostrocoris* Uhler, p. 205
20. Hind femora long, extending much beyond apex of venter, flattened, broadest before middle and more slender at apex *Phytocoris* Fallen, p. 211
 Hind femora shorter, not or scarcely extending beyond tip of abdomen 21
21. First segment of hind tarsus distinctly longer than third segment *Stenotus* Jak., p. 203
 First segment of hind tarsus distinctly shorter than third segment 22
22. Body above and below clothed with silky, sericeous or woolly pubescence *Polymcrus* Hahn, p. 186
 Body clothed only with simple pubescence 23
23. Length of first antennal segment subequal to or greater than width of head across eyes 24
 Length of first antennal segment much less than width of head across eyes 25
24. Second antennal segment somewhat thickened, spindle-shaped *Garganus* Stal., p. 204
 Second antennal segment cylindrical, not thicker on apical half *Ganocapsus* Van D., p. 204
25. Head broad, length of antennal segment I not equal to width of vertex; eyes practically in contact with pronotal angles 26
 Head not so broad, length of antennal segment I equal to or greater than width of vertex 27
26. Head broad, frons and vertex nearly vertical; vertex compressed, basal margin forming a sharp basal edge; eyes subpedunculate . . . *Bolteria* Uhler, p. 202
 Head broad, but vertex and frons sloping gradually forward, not vertical; basal margin of vertex not sharply elevated; eyes not subpedunculate
 *Dichrooscytus* Fieb., p. 192
27. Dorsal surface distinctly pubescent, dull 28
 Dorsal surface nearly glabrous, highly polished 29
28. Thickness of fourth antennal segment almost equal to that at base of segment II; mesal width of collar subequal to thickness of antennal segment IV
 *Adelphocoris* Reut., p. 203
 Thickness of fourth antennal segment distinctly thinner than base of segment II; mesal width of collar distinctly greater than thickness of segment IV
 *Calocoris* Fieb., p. 203
29. Rostrum short, scarcely surpassing anterior coxae . . . *Poccilocapsus* Reut., p. 204
 Rostrum longer, at least reaching posterior margins of middle coxae
 *Horcias* Dist., p. 204

Genus *Irbisia* Reuter

Key to the Species

- 1. Length of antennal segment II not exceeding width of pronotum at base 2
Length of antennal segment II distinctly greater than width of pronotum at base; eyes subpedunculate; length of antennal segment I greater than width of vertex; length 6.2 mm *pacifica* (Uhl.)
- 2. Legs with some pale color on coxae or tibiae 3
Legs uniformly black; length 6.0-6.2 mm *nigripes* Kngt.
- 3. Length of antennal segment I not equal to width of vertex 4
Length of antennal segment I subequal to width of vertex, (♀) about .04 mm. less; length (♂) 5.8 mm, (♀) 6.2 mm *elongata* Kngt.
- 4. Coxae pallid on apical half; rostrum reaching upon posterior coxae, yellowish; length 4.5 mm-5.4 mm *brachycera* (Uhl.)
Coxae and rostrum black, rostrum reaching upon apices of hind coxae; female brachypterous, costal margin strongly arcuate; length (♀) 5.3 mm, (♂) 6.0 mm *shulli* Kngt.

Irbisia pacifica (Uhler)

Rhopalotomus pacificus Uhler, 1872:415.
Thyrillus pacificus Uhler, 1894:267.
Irbisia pacificus Van Duzee, 1914:24.
Irbisia pacificus Slater, 1950:36, Pl. 2, Fig. 20.

This species is known from California, Nevada, Utah, Idaho, Montana, and Washington. The species was not taken at the test site, but this is not surprising as so little collecting specifically directed towards the mirids has been done there, especially in early spring and late fall, and at most higher elevations.

Irbisia shulli Knight

Irbisia shulli Knight, 1941:75.
This species is known from Idaho, Utah, Oregon, and Washington.

Irbisia brachycera (Uhler)

Rhopalotomus brachycerus Uhler, 1872:416.
Thyrillus brachycerus Uhler, 1895:39.
Irbisia arcuata Van Duzee, 1921:148, n. sp.
Irbisia brachycera Knight, 1941:79.

Known from Utah, Colorado, Idaho, Montana, Wyoming, Nebraska, and North Dakota. This species has been reported from California, but the writer has been unable to verify this early record. I collected 7 ♂ 5 ♀ June 29, 1965, at Scipio, Utah, which is about 200 miles due east of the test site. The species may well occur in Nevada.

Irbisia elongata Knight

Irbisia elongata Knight, 1941b:77.
This species is known from Idaho, Wyoming, and Washington.

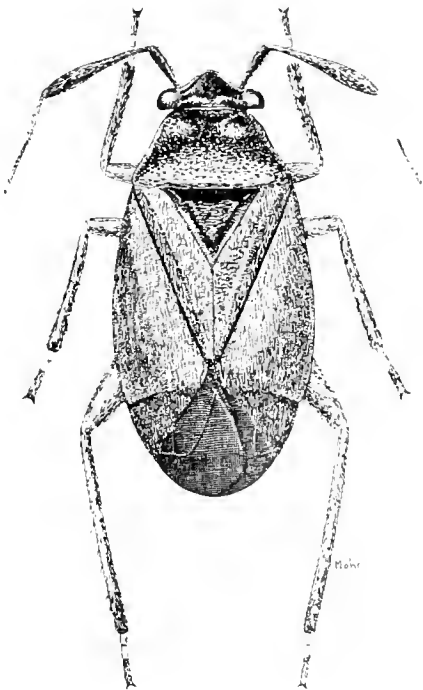


Fig. 246. *Capsus ater* (Linn.), ♀

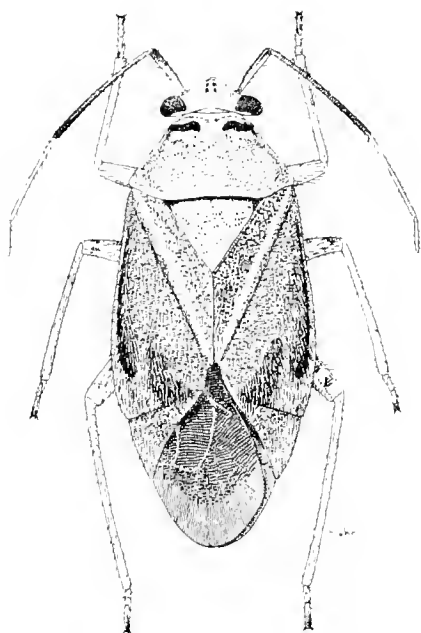


Fig. 247. *Tropidosteptes populi* Kngt., ♀.

Irbisia nigripes Knight

Irbisia nigripes Knight, 1925:94.

This species is known from Idaho, Montana, and Alberta, Canada.

Genus *Capsus* Fabricius

Capsus ater (Linnaeus)

Fig. 246

Cimex ater Linnaeus, 1758:447.

Capsus ater Fabricius, 1803:241.

Capsus ater Van Duzee, 1917:337.

Capsus ater Knight, 1941:138.

Commonly known from Alberta, Canada, and in Washington, Oregon, California, Idaho, Montana, Wyoming and eastward in the United States.

Host plants: Canada bluegrass (*Poa compressa*), couch grass (*Agropyron repens*) and occasionally other grasses such as timothy (*Phleum pratense*).

Genus *Polymerus* Hahn

Polymerus relativus Knight

Polymerus relativus Knight, 1926:165.

Very similar to *diffusus* (Uhler), but differs in the larger size and shorter rostrum which does not attain posterior margin of mesosternum.

Records from the Nevada Test Site: Area 18M, 3♂ 10♀ June 20, 1965, taken on *Chrysothamnus nauseosus*; Area 401M, 7♂ 15♀ June 18, 1965, taken on *Chrysothamnus nauseosus*.

Other records: 9♂ 7♀ July 12, 1965, Wells, Nevada (H. H. Knight), taken on *Chrysothamnus nauseosus*. 5♂ 1♀ June 29, 1965, Scipio, Utah (H. H. Knight), taken on *Chrysothamnus*. The preferred host appears to be *Chrysothamnus nauseosus*.

Polymerus diffusus (Uhler)

Pociloscytus diffusus Uhler, 1872:415.

Polymerus diffusus Knight, 1926:165.

Known from Arizona, California, Utah, Colorado, New Mexico, Idaho, Oregon, Washington, and British Columbia.

Records for Nevada: 2♂ 3♀ June 8, 1966, Goldfield; 2♂ June 7, 1966, Tonopah, Nye County (W. Gagne); Ormsby County (C. F. Baker).

Genus *Tropidosteptes* Uhler

Tropidosteptes vittifrons (Knight)

Neoborus vittifrons Knight, 1929:5.

This species is common in Arizona, breeding on *Fraxinus arizonicus*.

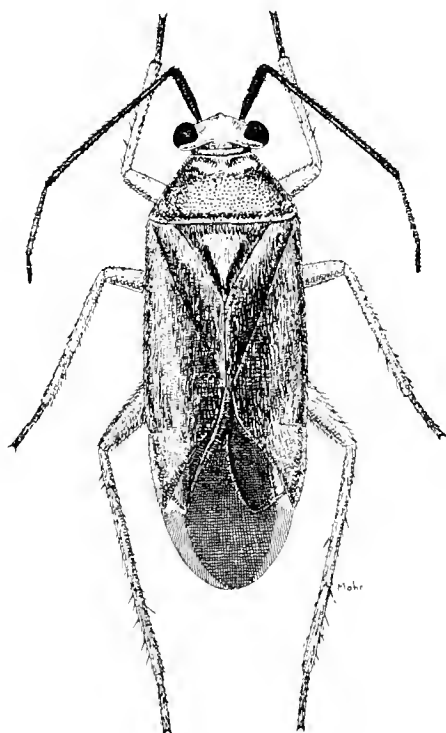


Fig. 248. *Lygidca mendax* Reut., ♀.

Records: 12♂ ♀ May 21, 1909, West Wats [sic.], Utah (E. D. Ball); ♂ July 8, 1930, Richfield, Utah (E. W. Davis), taken at light. ♂ ♀ May 25, 1963, Moapa (R. C. Bectel); ♂ ♀ June 6, 1966, Las Vegas, Nevada (D. F. Zoller), reported as defoliating ash, *Fraxinus*, shade trees in the city.

Tropidosteptes illitus (Van Duzee)
Neoborus illitus Van Duzee, 1921:120.
Neoborus illitus Usinger, 1945:585, figs., biol.
Described from Marin County, California, where it was breeding on ash, *Fraxinus*.

Genus *Lygidea* Reuter
Lygidea morio Reuter
Lygidea morio Reuter, 1909:47.
This species was reported only from California.

Lygidea annexa (Uhler)
Lygus annexus Uhler, 1872:413.
Lygidea annexus Knight, 1917:639, note.
This species was described from Colorado and later was reported from California. The writer has examined specimens only from Colorado.

Genus *Pinalitus* Kelton

Key to the Species

- 1. Rostrum reaching base of posterior trochanters, or beyond 3
Rostrum not reaching base of posterior trochanters 2
- 2. Length of second antennal segment exceeds width of pronotum at base; thickness of segment II less than segment I *solicagus* Van D.
Length of second antennal segment much less than width of pronotum at base; thickness of antennal segment II subequal to thickness of segment I (♂) *californicus*, n. sp.
- 3. Rostrum only reaching upon posterior trochanters, or upon fourth ventral segment 4
Rostrum reaching beyond posterior trochanters, or upon sixth ventral segment *approximatus* Stal
- 4. Dorsal surface clothed with long, simple, suberect pubescence, extending well above the silvery sericeous pubescence; (♀) length of second antennal segment not equal to width of pronotum at base *utahensis*, n. sp.
Dorsal surface with simple pubescence more recumbent, not conspicuously suberect; (♀) length of second antennal segment subequal or greater than width of pronotum at base 5
- 5. Frons with red transverse lines; dorsal surface reddish yellow; size smaller, length 4.7-4.9 mm *rubroinctus*, n. sp.
Frons without red lines; hemelytra marked with fuscous (♂), or dappled with reddish only (♀); larger, length 5.1-5.7 mm *brevirostris*, n. sp.

Pinalitus approximatus (Stal)
Deracocoris approximatus Stal, 1858:185.
Lygus approximatus Reuter, 1879:53.
Lygus approximatus Knight, 1917:597, Fig. 180.
Pinalitus approximatus Kelton, 1955:536, figs.
Known from Alaska, Washington, Idaho, Colorado, New Work, and British Columbia in Canada. Occurs on spruce, *Picea*.

Pinalitus brevirostris, new species
Allied to *approximatus* (Stal) but differs in the distinctly shorter rostrum which reaches only upon posterior trochanters.
Male. Length 5.7 mm, width 2.0 mm. Head: clypeus not black. Rostrum, length 2.1 mm, reaching upon base of posterior trochanters, pallid, apex blackish. Antennae: segment I,

length .51 mm, pale yellowish, with very fine, short, fuscous pubescent hairs; II, 2.0 mm, cylindrical, pale dusky yellow, with minute short pubescence; III, .88 mm, pale fuscous; IV, .47 mm, fuscous. Pronotum, length .85 mm, width at base 1.6 mm, disk minutely punctate, yellowish, calli and a submarginal band along basal margin, and base of propleura, blackish, collar white. Scutellum fuscous, lateral margins, apex and part of median line pale, clothed with short, simple yellowish pubescent hairs. Hemelytra pale to yellow and dusky brown, the darker color broken by dappled paler areas: cuneus pallid, apex and basal area with reddish brown pigment in hypodermis; clothed with rather short, recumbent, yellowish simple hairs and thickly intermixed with appressed, silvery sericeous pubescence. Membrane pale, lightly shaded with fumate to dusky brown, veins reddish brown. Ventral surface pale yellowish and fuscous, mesosternum fuscous. Venter pallid, a lateral line and the genital segment fuscous. Legs pallid to yellowish, coxae more white, femora dusky yellow, hind pair more brownish, tibiae dusky yellow, spines brown, without spots.

Female. Length 5.2 mm, width 2.1 mm. Head: width 1.05 mm, vertex .44 mm; brownish yellow, lines absent. Rostrum, length 2.2 mm, reaching upon posterior trochanters, yellowish brown, apex blackish. Antennae: segment I, length .44 mm, just equal to width of vertex, yellowish brown; II, 1.66 mm, cylindrical, slender, only slightly thicker near apex, pale yellowish; III, .85 mm, pale fuscous; IV, .51 mm, pale fuscous. Pronotum, length .85 mm, width at base 1.7 mm, subequal to length of antennal segment II; disk and calli light yellow, a narrow submarginal fuscous band along base. Scutellum with or without fuscous. Hemelytra yellowish, hypodermis of clavus and corium with reddish brown pigment, which shows in a reticulate pattern, or dappled with lighter spots. Ventral surface and legs yellowish brown, without fuscous shading or marks.

Holotype: ♂ Aug. 8, 1925, alt. 9000 ft, Stonewall, near Trinidad, Colorado (H. H. Knight). **Allotype:** ♀ same data as the type. **Paratypes:** 4♂ 5♀, taken with the types on spruce, *Picea engelmanni*.

Pinalitus utahensis, new species

Allied to *brevirostris* but differs in the slightly shorter rostrum, thicker and more erect pubescence; frons with transverse red lines, also with red on the juga and lora.

Male. Length 5.0 mm, width 1.9 mm. Head: width 1.02 mm, vertex .34 mm; light yellow brown, frons with median line, transverse lines each side and arc line at base, red; juga, lora, and margin of gena, red. Rostrum, length 2.0 mm, pale yellow, apex black, reaching upon apex of hind coxae. Antennae: segment I, length .52 mm, yellowish; II, 1.94 mm, cylindrical, yellowish brown, thickly covered with short yellowish pubescence; III, 1.0 mm, fuscous brown; IV, .51 mm, fuscous. Pronotum, length .88 mm, width at base 1.63 mm, disk finely punctate, calli and a band around basal margin black, basal edge white. Dorsal surface thickly clothed with suberect simple golden hairs, and thickly intermixed with more appressed, silvery sericeous pubescence. Scutellum yellowish, fuscous each side of a pale median line. Hemelytra yellowish brown, clavus and corium with spot shading of fuscous and brown, also with indistinct patches of paler color; cuneus pale to yellowish, apex brownish black, discal area with some reddish in hypodermis. Membrane pale, apical half with irregular pattern of fuscous shading, veins reddish brown, also with some fuscous shading within areoles. Ventral surface pale yellowish to fuscous, mesosternum fuscous; venter pallid to white beneath, sides with a broad reddish lateral line, genital segment brownish black. Legs pale yellowish, hind femora with an irregular pattern of reddish brown on anterior aspect; tibiae pale yellowish, spines reddish brown.

Female. Length 5.0 mm, width 2.2 mm. Head: width 1.10 mm, vertex .47 mm; yellowish brown, frons without lines but with red on juga, lora, and edge of genae. Rostrum, length 2.3 mm, reaching upon posterior trochanters. Antennae: segment I, length .50 mm; II, 1.7 mm, cylindrical, more slender than in the male, length subequal to width of pronotum at base. Pronotum, length .98 mm, width at base 1.73 mm, black color along basal margin much reduced.

Holotype: ♂ July 26, 1917, Mt. Lemon, alt. near 9000 ft, Santa Catalina Mts., Arizona (H. H. Knight). **Allotype:** ♀ taken with the type. **Paratypes:** ♂ taken with the types. ♂ Aug. 13, 1916, Soldier Summit, Utah.

Pinalitus solivagus (Van Duzee)

Lygidca solivaga Van Duzee, 1921:119.

This species was described from Siskiyou County, California. The present placement of the species in the genus *Pinalitus* is based on study of paratypes.

Pinalitus rubrotinctus, new species

Runs in the key to the couplet with *brevirostris*, but may be separated by the smaller size, red lines on head and reddish yellow color.

Male. Length 4.7 mm, width 1.8 mm. Head: width .92 mm, vertex .36 mm; brownish yellow, frons with transverse and median lines red, juga, lora and genae reddish. Rostrum, length 2.0 mm, reaching upon posterior trochanters, yellowish brown, apex dark brown. Antennae: segment I, length .47 mm, pale yellowish; II, 1.7 mm, cylindrical, pale yellowish; III, .98 mm, yellowish brown; IV, .52 mm, dusky brown. Pronotum, length .74 mm, reddish brown, calli and margins of disk becoming infuscated, collar and basal edge of disk white; disk finely punctate. Scutellum reddish brown, apex pallid. Dorsal surface clothed with rather short, recumbent, fine simple yellowish pubescent hairs, and sparsely intermixed with silvery sericeous hairs. Hemelytra reddish yellow to reddish brown, subtranslucent along outer and apical margins of clavus, embolium and cuneus more reddish. Membrane pale, tinged with brown, veins reddish brown. Ventral surface brownish yellow, sides more reddish; venter pallid on middle, sides reddish brown, genital segment yellowish brown. Legs pale yellowish brown, hind femora more reddish brown; tibiae pale yellowish spines light brown.

Female. Length 4.8 mm, width 2.0 mm. Head: width .98 mm, vertex .46 mm. Rostrum, length 2.2 mm, reaching full length of posterior trochanters. Antennae: segment I, length .47 mm; II, 1.63 mm; III, .92 mm; IV, .51 mm. Pronotum, length .84 mm, width at base 1.62 mm. Slightly more robust than the male, but very similar in color and pubescence.

Holotype: ♂ July 26, 1917, Mt. Lemon, alt. 9000 ft, Santa Catalina Mts., Arizona (H. H. Knight). **Allotype:** ♀ same data as the type. **Paratypes:** ♂ 4 ♀ taken with the types. ♂ 2 ♀ Aug. 9, 1930, San Francisco Mts., Arizona (E. D. Ball).

Pinalitus californicus, new species

Runs in the key to the couplet with *solivagus* (Van D.) from which it may be separated by the shorter and thicker second antennal segment.

Male. Length 5.0 mm, width 2.0 mm. Head: width 1.08 mm, vertex .44 mm; yellowish, vertex narrowly red bordering basal carina, face with reddish along sutures. Rostrum not reaching

apex of hind coxae, but due to faulty point mounting it is obscured and defies measurement. Antennae: segment I, length .54 mm, yellowish; II, 1.32 mm, slender at base but tapering thicker on middle, thickness on apical half subequal to segment I, yellowish, rather thickly pubescent; III, .61 mm, dusky yellow. Pronotum, length .91 mm, width at base 1.7 mm; disk finely punctate, yellowish, a definite but narrow dark line borders lateral margins and extends along basal margin as a narrow submarginal line just inside the pallid edge. Scutellum pallid to yellowish. Dorsal surface including the hemelytra finely but definitely punctate, nearly glabrous, but bearing minute short pubescence. Hemelytra yellowish, punctures on corium fuscous, tip of clavus and small spot on base of paracuneus fuscous. Membrane pale, apical area and reticulate pattern on central area, and the veins fuscous. Ventral surface yellowish, venter dotted with minute reddish hypodermal dots. Legs pale yellowish, hind femora shaded with fuscous on apical half; tibiae pale, brown spines with small fuscous dot at base of each.

Holotype: ♂ May 21, 1879, alt. 1750 ft, Geysers, California (collector's name absent), U. S. N. M.

Genus *Orthops* Fieber*Orthops campestris* (Linnaeus)

Cimex campestris Linnaeus, 1758:448.

Orthops pastinacae Fieber, 1861:279.

Lygus campestris Reuter, 1888:271.

Lygus campestris Knight, 1917:592, Fig. 177.

Lygus campestris Knight, 1941:148, key.

Orthops campestris Carvalho, 1959:176, cat.

So far this species has not been taken at the test site, but a specimen was taken about 150 miles to the east: ♀ June 29, 1965, Cedar City, Utah (H. H. Knight).

Known distribution: Arizona, California, Utah, Idaho, Colorado and most states to the east. Breeds on plants belonging to the Umbelliferae.

Genus *Lygus* Hahn*Lygus desertinus*, new name

Capsus desertus Becker, 1864:487.

Lygus desertus Knight, 1944:471.

I agree with some authors that *Capsus desertus* Becker (1864) probably belongs in the genus *Lygus* where *L. desertus* Knight (1944) would be preoccupied. To prevent future changes of name I accept this viewpoint, and

propose *desertinus* as a new name. There is some doubt, however, whether the Becker paper is a valid publication.

This species is known from Arizona, California, Nevada, Utah, Colorado, Wyoming, Idaho, Oregon, and Washington. It is typical of the Great Basin area, and extends into the western edges of Colorado and Wyoming, and northward along the eastern edges of Oregon and Washington. It is common in the semiarid areas of these western states where it is the most widespread and frequent species of Miridae. Its distribution at the test site is indicated in Table 1. At the test site, *L. desertinus* was taken most commonly from *Stanleya pinnata* and *Chrysothamnus viscidiflorus*. In the four months that it

was collected, it was more abundant in June than in July and August. Only one specimen was taken in October.

Lygus elisus Van Duzee

Lygus pratensis var. *elisus* Van Duzee, 1914:20.

Lygus elisus Van Duzee, 1916:40, list.

Lygus elisus Shull, 1933:1076.

Lygus elisus Knight, 1941:152, distr.

Records for the test site: Area 1M, ♂ 2 ♀ July 16, 1965, taken at incandescent light; Area M (Mercury), ♀ Aug. 3, 1965, at incandescent light; Area 5M, 2 ♂ 1 ♀ Aug. 13, 1965, on *Stanleya pinnata*; ♀ Aug. 18, 1965, on *Salsola kali*; Area 12M, ♀ Aug. 6, 1965, on *Chrysothamnus*

Table 1. Collection records of *Lygus desertinus* at the Nevada Test Site.

Host and no. collections	Area	Date ¹	No. specimens
<i>Artemisia tridentata</i> (3)	12, 19, F	June 23, July 31 (1962) Aug. 9	15 ♂ ♀
<i>Astragalus lentiginosus</i> (1)	T	June 14	♂ ♀
<i>Atriplex canescens</i> (5)	16, 18	June 12, 20, 23, 24, July 7	11 ♂ ♀
<i>Baileya multiradiata</i> (2)	17, C	June 10, 12	18 ♂ ♀
<i>Castilleja</i> sp. (1)	C	June 13	♂
<i>Chaenactes stevioides</i> (1)	C	June 13	♂
<i>Chenopodium fremonti</i> (1)	12	Aug. 6	♀
<i>Chenopodium leptophyllum</i> (1)	12	Aug. 7	♀
<i>Chrysothamnus viscidiflorus</i> (11)	6, 12, 17	June 11, 15, July 27, Aug. 1, 5, 6, 7, 23, 25	63 ♂ ♀
<i>Elymus cinereus</i> (1)	12	Aug. 13	♀
<i>Eriogonum</i> sp. (2)	12	Aug. 26	2 ♀
<i>Eriogonum deflexum</i> (5)	12, 16	Aug. 1, 6, 11, 23	26 ♂ ♀
<i>Franseria acanthocarpa</i> (4)	12, 17	July 5, 19, 27, Aug. 26	23 ♂ ♀
<i>Grayia spinosa</i> (1)	401	June 18	22 ♂ ♀
<i>Lepidium</i> sp. (1)	C	June 13	19 ♂ ♀
<i>Lepidium fremontii</i> (1)	9	June 10	♂
<i>Lupinus argenteus</i> (1)	19	June 22	7 ♂ ♀
<i>Malacothrix glabrata</i> (1)	17	June 12	23 ♂ ♀
<i>Oenothera californica</i>	18	June 11	3 ♂ ♀
<i>Ribes</i> sp. (1)	12	Aug. 11	♀
<i>Rumex salicifolius</i> (3)	2, 12	June 18 (1964)	3 ♂
<i>Sphaeralcea</i> sp. (1)	17	June 17	10 ♂ ♀
<i>Stanleya pinnata</i> (12)	5, 11, 16, C	June 10, 12 (1964), July 20 (1964), Aug. 6, 11, 13, 20, 23, 28, Oct. 19 (1960)	74 ♂ ♀
<i>Tetradymia axillaris</i> (1)	C	June 13	♀
<i>Tetradymia glabrata</i> (2)	C	July 1, 7	10 ♂ ♀
Unknown (15)	17, 18 5, 12, 16, 17, 18, 19, 401, T, M, E	June 10, 11, 14, 17°, 24, July 14, 22°, 25° (1962), Aug. 8°, 9°, (1964), 9°° (1964), 15°, 17	59 ♂ ♀

¹1965 unless otherwise indicated.

°Incandescent-light trap.

°°Black-light trap

viscidiflorus; Area 17M, ♂ Aug. 5, 1965, on *Franseria acanthicarpi*; ♂ Aug. 26, 1965, on *Franseria acanthicarpi*.

In the western states this species is generally very abundant in alfalfa fields along with *Lygus hesperus*, but is not regarded as destructive of seed as the species *hesperus*. Shull (1933) has shown that *elisus* prefers bean plants where they are grown, reporting that the species was a destructive pest of beans in Idaho.

Lygus hesperus Knight
Fig. 250

- Lygus elisus* var. *hesperus* Knight, 1917:575.
- Lygus hesperus* Shull, 1933:1076.
- Lygus hesperus* Stitt, 1940:19.
- Lygus hesperus* Knight, 1941:151.

This is the "legume bug" of Shull (1933) who completed a thesis project covering the life history and host preferences of this species in Idaho. Later Stitt (1940), working in Arizona, demonstrated that feeding by this species on alfalfa destroyed the ovaries of developing seed, and that *hesperus* is responsible for serious losses in alfalfa seed production.

Lygus hesperus has been collected in all states along the 100th meridian and the other western states. It thrives best where there is enough moisture to grow alfalfa and other herbaceous plants. *Hesperus* has a wider distribution than *desertinus*, occurring at higher elevations in all the mountains of the western states. This species is the most variable in color and size of any *Lygus*, and is best distinguished by

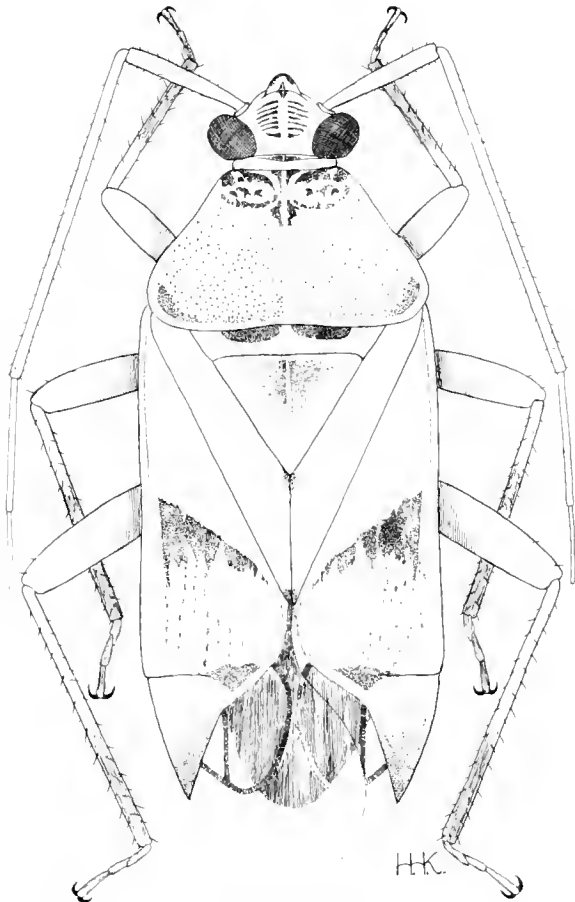


Fig. 249. *Platylagus vanduzeei* Usinger, ♀.

the long rostrum which exceeds slightly the apices of the posterior coxae.

Records for the test site are shown in Table 2.

Table 2. Collection records of *Lygus hesperus* at the Nevada Test Site.

Host and no. collections	Area	Date ¹	No. specimens
<i>Berula erecta</i> (1)	CE	July 18 (1961)	♂
<i>Chrysothamnus viscidiflorus</i> (3)	12M, 17M	Aug. 5, 6, 27	3♀
<i>Eriogonum deflexum</i> (3)	12M, 16M	Aug. 6, 11, 23	3♂ 2♀
<i>Eriogonum inflatum</i> (1)	16M	Aug. 20	♀
<i>Eriogonum nodosum</i> (2)	16M, 17M	Aug. 30	♂ ♀
<i>Franseria acanthacarpa</i> (1)	17M	Aug. 5	2♀
<i>Rumex salicifolius</i> (1)	12C1	June 18 (1964)	3♂
<i>Salix goodingii</i> (1)	12C1	June 18 (1964)	♂
<i>Stanleya pinnata</i> (6)	5HN, 5M, 12M, 16M	July 20, 29 (1964), Aug. 13, 20, 23, 28	6♂ 4♀
<i>Tamarix pentandra</i> (1)	401M	July 27	♂ ♀
Unknown (10)	1B, 5M, 16M, 17M, 401M, M	June 10, 12, 18, 20, July 20°, 31°°, Aug. 8°, 17, 23°	6♂ 9♀

¹1965 unless otherwise indicated.
°Incandescent-light trap.
••Black-light trap

Genus *Platylygus* Van Duzee*Platylygus vanduzeei* Usinger

Fig. 249

Platylygus vanduzeei Usinger, 1931:129, fig.*Platylygus vanduzeei* Usinger, 1933:172, distr.

This large, robust species may usually be recognized by the wedgeshaped mark of darker color across middle of corium, while the calli have reddish brown dots, marks and lines. Length 6.8 mm, width 2.9 mm. Rostrum reaching near

apex of posterior coxae. The species is known from California, Arizona, Nevada, Utah, Colorado, and New Mexico. At the test site this species was found only on *Pinus monophylla*, but in Arizona and Colorado it was taken from *Pinus ponderosa*.

Records from the test site: Area 18M, 4♂ 17♀ June 23, 1965; Area 19M, 4♂ 14♀ June 23, 1965; Area 401M, 4♂ 11♀ June 19, 1965. Other record: 24♂ May 26, 1961, Mt. Springs Summit, alt. 4500 ft, Clark County, Nevada (R. C. Bechtel), on *Pinus monophylla*.

Genus *Dichrooscytus* Fieber

Key to the Species

1. Rostrum not reaching beyond apex of hind coxae 2
 Rostrum reaching upon posterior trochanters or beyond 11
2. Rostrum reaching upon hind coxae 4
 Rostrum not reaching beyond middle coxae 3
3. Pronotum deeply rugulose; hemelytra pale, sprinkled with a few red flecks; apical margin of corium and embolium, and tip of cuneus, fuscous to black; length 3.5 mm *rugosus*, n. sp.
 Pronotum only slightly rugulose; hemelytra pallid to yellowish, without red flecks; apical margin of corium and embolium, and spot on clavus by apex of scutellum, fuscous; length 4.4 mm *elegans* Uhler
4. Pronotum punctate, surface of disk distinctly shining; length 4.5 mm. *nitidus*, n. sp.
 Pronotum not distinctly punctate; surface of the disk not distinctly shining 5
5. Clavus not infuscated 6
 Clavus fuscous on inner half bordering scutellum, apical area of corium also fuscous; length 3.7 mm *fuscusignatus*, n. sp.
6. Hemelytra largely red, hypodermis of clavus and corium thickly filled with red granulations; length 4.4 mm *irroratus* Van D.
 Hemelytra not so red, only very few if any red flecks on clavus and corium; color mostly pallid, yellowish green 7
7. Body and hemelytra brownish yellow, or tan colored; corium not distinctly fuscous on apical area; narrow apex of cuneus may be dark or reddish; length 3.9 mm *flavescens*, n. sp.
 Body and hemelytra greenish, or yellowish but with fuscous on apical area of corium, or cuneus with red more extensive than narrow apex 8
8. Dorsal surface green or greenish 9
 Dorsal surface more yellowish than green 10

9. Veins of the membrane and tip of cuneus, red; length (♀) 4.8 mm, (♂) 5.6 mm *rufivenosus*, n. sp.
 Veins of the membrane yellow, without red on veins or tip of cuneus; length (♀) 4.4 mm, (♂) 5.1 mm *flavivenosus*, n. sp.
10. Vertex wider than one-third the width of head; scutellum with a bit of red on median line; cuneus with basal half and spot on apex, red; length 3.5 mm *cuneatus*, n. sp.
 Male vertex only equal to one-third the width of head; scutellum uniformly yellowish; cuneus with reddish only on narrow apex; length 4.4 mm *angustifrons*, n. sp.
- 11(1). Hemelytra chiefly red 12
 Hemelytra not chiefly red, sometimes with some red granulations in the hypodermis 18
12. Paracuneus and scutellum pallid 13
 Paracuneus red like the corium 14
13. Frons and vertex strongly convex, base of clypeus not visible from above; length 5.0 mm *convexifrons*, n. sp.
 Frons and vertex rather flat, base of clypeus visible from above; length 5.4 mm *suspectus* Reut.
14. Rostrum reaching upon eighth ventral segment (♀), or to genital segment in the male 15
 Rostrum reaching only to fifth ventral segment, or upon posterior trochanters 16
15. Vertex narrow, subequal to dorsal width of an eye (♂), or (♀) subequal to length of antennal segment I; paracuneus deeply colored like the corium and cuneus; length 5.7 mm *rufipennis* (Fall.)
 Vertex wider, equal to half the width of head (♂), and greater than half the width (♀); paracuneus paler than corium; length 4.7 mm *rainieri*, n. sp.
16. Width of vertex subequal, or equal to more than half the width of head 17
 Width of vertex distinctly less than half the width of head; length 3.7-4.0 mm *ruberellus*, n. sp.
17. Width of vertex somewhat greater than half the width of head; length 4.3-4.8 mm *latifrons*, n. sp.
 Width of vertex subequal to half the width of head; length 5.0-5.3 mm *adamsi*, n. sp.
- 18(11). Corium with a black vitta placed upon a wedge-shaped red area; paracuneus clear translucent; length 5.1 mm *vittatipennis*, n. sp.
 Corium without the black vitta placed on red of the corium 19
19. Cuneus red, or reddish orange, outer margin may be pallid 20
 Cuneus pallid, apex and narrowly along inner margin, red 23

20. Rostrum reaching beyond posterior trochanters 21
 Rostrum only reaching upon posterior trachanters 22
21. Veins about areoles reddish brown; paracuneus tinted reddish orange; hemelytra with reddish brown pigment in hypodermis coagulated, breaking down and leaving clear spaces; length 4.6 mm *deleticus*, n. sp.
 Veins about areoles pallid; paracuneus and inner basal angle of cuneus, white; hemelytra largely pink to orange colored, not coagulated and forming clear spaces; length 4.4 mm *pinicola*, n. sp.
22. Corium and clavus rather uniformly pink red, the color due to small dots and granulations in hypodermis; scutellum and cuneus more of a smooth pink; head pallid, eyes black; length 4.2 mm *utahensis*, n. sp.
 Corium with reddish band across apical margin, also irregularly red on middle of corium; length 5.0 mm *junipericola*, n. sp.
23. Dorsal surface light brownish yellow; scutellum with a triangular reddish mark each side just before apex; corium with a reddish band across apical margin, veins of membrane and apex of cuneus, red *barberi* Knegt.
 Dorsal surface pallid, or shaded and marked with reddish brown 24
24. Yellowish brown, clavus and corium without fuscous marks or dots; width of vertex (♂) a trifle less than dorsal width of an eye; length 3.0 mm *minimus*, n. sp.
 Dorsal surface pallid, but shaded and marked with reddish, or red brown 25
25. Pubescent hairs and bristles on head and pronotum, black; central area of corium and of clavus, with a group of red dots, a few joining together at center to make an irregular blotch *apicalis*, n. sp.
 Pubescent hairs and bristles on head and pronotum, golden yellow; central area of corium and of clavus, without a group of red dots; apical area of corium and inner half of clavus at middle, fuscous *vittatus* Van D.

Dichrooscytus irroratus Van Duzee

Dichrooscytus irroratus Van Duzee, 1912:482.

Record for the test site: Area 12M, ♀ Aug. 9, 1965 (J. M. Merino), at incandescent light; Area ECH, ♀ Aug. 5, 1963, at black light.

This species was described from Colorado, and is now known from Idaho, Utah, Wyoming, New Mexico, and Texas. It is known to breed on *Juniperus*, and probably on more than one species.

Dichrooscytus elegans Uhler

Dichrooscytus elegans Uhler, 1904:356.

This species was described from New Mexico. It is distinguished by the short rostrum as shown in the key. Specimens from the eastern

states have been assigned here by later writers, but I find that they are not the same.

Probably the type was taken at light, since Dr. Schwarz stated that "all specimens were collected in the vicinity of the Montezuma Hotel, which is situated at the mouth of the Gallinas River Canyon, at an altitude of 6770 ft."

Dichrooscytus rugosus, new species

Runs in the couplet with *elegans* Uhler, where the rostrum does not surpass the middle coxae; differs from all known species by the deeply rugose pronotum.

Female. Length 3.4 mm, width 1.5 mm. Head: width .98 mm, vertex .41 mm; pallid, frons with several oblique, impressed lines each

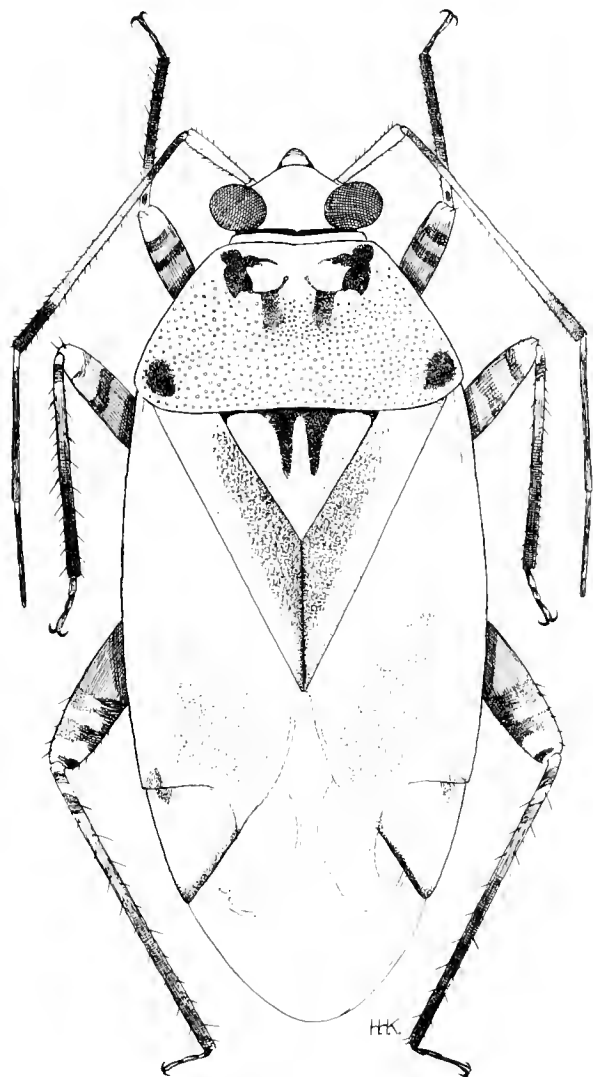


Fig. 250. *Lygus hesperus* Kngt., ♂.

side of median line; apical half of clypeus, and line each side extending to base, reddish purple. Rostrum, length 1.05 mm, reaching to middle of intermediate coxae, pallid, apex black. Antennae: segment I, length .30 mm, pallid; II, 1.22 mm, slender, pallid; III, .47 mm, dusky; IV, .28 mm, dusky. Pronotum, length .74 mm, width at base 1.36 mm; disk coarsely and deeply punctate, the punctures more or less connected by transverse rugulose lines; calli convex, deeply impressed at mesal angles; pallid, sparsely sprinkled with reddish purple flecks. Scutellum strongly convex, punctate and transversely rugulose; sparsely dotted with purple. Dorsal surface clothed with recumbent, pale to yellowish simple pubescent hairs. Hemelytra pallid, apical margin of corium and embolium, and apex of cuneus fuscous to black; clavus and corium

sprinkled with reddish flecks and dots, a limited fuscous spot on clavus by apex of scutellum; cuneus white, with a few red flecks on basal half, apex black. Membrane light fuscous brown, veins white. Ventral surface white, mesosternum, patches on sides of thorax and basal half of venter, red purple. Legs pallid, a few reddish flecks on femora, tips of tarsi fuscous.

Holotype: ♀ June 13, 15 mi N of St. George, Utah (Russian). **Paratypes:** ♀ taken with the type. ♀ July 14, alt. 7000 ft., Magdalena, New Mexico.

Dichrooscytus nitidus, new species

Distinguished in the key by the punctate pronotum and shining surface.

Male. Length 4.5 mm, width 1.6 mm. Head: width 1.05 mm, vertex .34 mm; brownish yellow, frons with transverse pallid lines on frons. Rostrum, length 1.4 mm, reaching upon apex of posterior coxae. Antennae: segment I, length .45 mm, pale greenish; II, 2.1 mm, cylindrical, pale greenish yellow; III, .85 mm, pale to dusky; IV, .51 mm, dusky. Pronotum, length .71 mm, width at base 1.3 mm, pale to greenish yellow, shallowly punctate, shining, with fine short, sparsely set pubescence. Scutellum moderately convex, brownish yellow, apex paler. Hemelytra brownish yellow, tip of clavus and apical margin of corium reddish brown; cuneus brownish yellow, apical half of inner edge and narrow apex red. Membrane pale fuscous, paler on middle; veins red, apical half of brachium and a callus spot

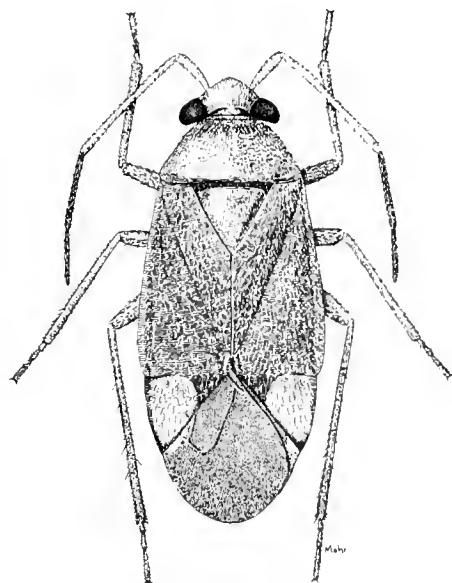


Fig. 251. *Dichrooscytus viridicans* Kngt., ♀.

bordering apex of larger areole, white. Ventral surface and legs, pallid to greenish. Genital segment and claspers typical of the genus.

Female. Length 4.4 mm, width 1.8 mm. Head: width 1.10 mm, vertex .41 mm. Rostrum, length 1.5 mm, reaching upon apex of hind coxae. Antennae: segment I, length .47 mm, yellowish green; II, 1.8 mm, cylindrical, slightly more slender near base; III, .85 mm, pale to dusky; IV, shriveled.

Holotype: ♂ Aug. 12, 1925, Pagosa Springs, Colorado (H. H. Knight), swept from *Juniper*. **Allotype:** ♀ same data as type. **Paratypes:** 2 ♀ taken with the types.

Dichrooscytus fuscusignatus, new species

Distinguished as shown in the key; pale yellowish, inner half of clavus and apical fourth of the corium shaded with fuscous.

Male. Length 3.7 mm, width 1.36 mm. Head: width .88 mm, vertex .34 mm; frons with striae poorly indicated. Rostrum, length 1.18 mm, just reaching upon apex of hind coxae. Antennae: segment I, length .30 mm, yellowish; II, 1.77 mm, cylindrical, pale yellowish; III, broken. Pronotum, length .64 mm, width at base 1.26 mm; indistinctly punctate, minutely transversely rugulose; pallid to yellowish, finely and minutely pubescent. Scutellum uniformly pallid. Hemelytra pallid, subtranslucent, inner half of clavus and apical fourth of corium fuscous; pale to yellowish pubescent; membrane uniformly fumate, brachium opaque, yellowish, a calloused line bordering apex of larger areole. Ventral surface and legs pallid to yellowish. Genital segment fuscous and brown; genital claspers distinctive of the genus.

Female. Length 3.7 mm, width 1.5 mm. Head: width .90 mm, vertex .41 mm. Rostrum, length 1.2 mm, reaching upon apex of hind coxae. Antennae: segment I, length .34 mm; II, 1.3 mm; III, .51 mm; IV, .32 mm. Pronotum, length .64 mm, width at base 1.18 mm. Color and pubescence very similar to the male.

Holotype: ♂ Aug. 12, 1925, Pagosa Springs, Colorado (H. H. Knight). **Allotype:** ♀ same data as the type. **Paratypes:** 2 ♂ 2 ♀, taken with the types on *Juniperus*.

Dichrooscytus flavescens, new species

Runs in the key near *rufivenosus* from which it differs by the smaller size, and yellowish or tan color.

Male. Length 3.9 mm, width 1.6 mm. Head: width 1.0 mm, vertex .40 mm; brownish yellow. Rostrum, length 1.39 mm, reaching to apex of hind coxae. Antennae: segment I, length .41 mm, yellowish; II, 1.9 mm, cylindrical, light brownish yellow; III, .68 mm, pale fuscous; IV, .40 mm, dusky. Pronotum, length .71 mm, width at base 1.32 mm, disk minutely rugulose, uniformly light yellowish brown. Scutellum moderately convex, apical half more flat and transversely rugulose, brownish yellow. Dorsal surface clothed with recumbent, fine simple yellowish pubescence. Hemelytra uniformly light brownish yellow, or tan colored; cuneus light yellow, narrow apex red. Membrane uniformly pale dusky brown; veins yellowish, reddish about the smaller areole. Ventral surface and legs uniformly light brownish yellow.

Female. Length 4.0 mm, width 1.7 mm. Head: width 1.02 mm, vertex .44 mm. Rostrum, length 1.3 mm, reaching upon hind coxae. Antennae: segment I, length .34 mm; II, 1.53 mm; III, .58 mm; IV, .34 mm. Pronotum, length .75 mm, width at base 1.42 mm. Coloration and pubescence very similar to the male, except cuneus without the red apex.

Holotype: ♂ Aug. 19, 1927, Newcastle, Wyoming (H. H. Knight). **Allotype:** ♀ same data as the type. **Paratypes:** 18 ♂ 11 ♀ taken with the types: 4 ♂ July 29, 1931, Medicine Bow Mts., Wyoming (H. H. Knight).

Dichrooscytus rufivenosus, new species

In the key this species runs in the couplet with *flavivenosus* from which it may be separated by the bright red veins in membrane, and red apex of the cuneus.

Male. Length 5.6 mm, width 1.5 mm. Head: width .95 mm, vertex .37 mm; brownish yellow. Rostrum, length 1.1 mm, only slightly exceeding apex of middle coxae, or to middle of hind coxae. Antennae: segment I, length .44 mm, pale yellowish; II, 1.8 mm, cylindrical, greenish yellow; III, .78 mm, pale to dusky; IV, .37 mm. Pronotum, length .68 mm, width at base 1.29 mm, yellowish green, finely rugulose near sides of disk; finely pale pubescent as on the hemelytra. Scutellum moderately convex. Hemelytra green, pigment in hypodermis tends to coagulate in dry specimens; sparsely and finely pubescent; cuneus green, narrow apex red. Membrane pale fuscous, veins bright red. Ventral surface and legs pale green. Genital segment and claspers typical of the genus.

Female. Length 4.2 mm, width 1.5 mm. Head: width .78 mm, vertex .44 mm. Rostrum, length 1.15 mm, slightly surpassing middle coxae, reaching to middle of hind coxae. Antennae: segment I, length .42 mm; II, 1.5 mm, slightly more slender on basal half; III, .74 mm; IV, .40 mm. Pronotum, length .66 mm, width at base 1.3 mm. Color and pubescence very similar to the male.

Holotype: ♂ Aug. 12, 1925, Pagosa Springs, Colorado (H. H. Knight). **Allotype:** ♀ same data as the type. **Paratypes:** 14♂ 43♀ taken with the types. 4♀ Aug. 3, 1929, Payson, Arizona (E. D. Ball). ♂ Aug. 15, 1930, Richfield, Utah (E. W. Davis), at light.

Dichrooscytus flavivenosus, new species

Allied to *rufivenosus* but size smaller, veins of the membrane yellow.

Male. Length 5.1 mm, width 1.46 mm. Head: width .79 mm, vertex .37 mm, pale greenish yellow. Rostrum, length 1.40 mm, barely exceeding tips of middle coxae, or reaching upon middle of hind coxae. Antennae: segment I, length .37 mm, pale greenish yellow; II, 1.9 mm, cylindrical, slightly more slender near base, greenish yellow, brownish on apical fourth; III, .62 mm, dusky yellow; IV, .34 mm, dusky. Pronotum, length .68 mm, width at base 1.29 mm; disk somewhat rugulose near lateral margins; sparsely clothed with suberect, golden yellow pubescent hairs. Hemelytra with pubescence similar to that on pronotum, color greenish yellow, cuneus more pallid. Membrane nearly clear but tinged with pale dusky brown; veins definitely yellow, without red. Ventral surface pale yellowish to green. Legs uniformly pale yellowish, tips of tarsi fuscous. Genital claspers typical for the genus.

Female. Length 3.7 mm, width 1.7 mm. Head: width 1.02 mm, vertex .41 mm. Rostrum, length 1.36 mm, reaching upon middle of hind coxae. Antennae: segment I, length .37 mm; II, 1.4 mm; III, .62 mm; IV, .34 mm. More robust than the male but very similar in color and pubescence.

Holotype: ♂ Sept. 6, 1931, Grand View, Grand Canyon, Arizona (H. H. Knight). **Allotype:** ♀ taken with the type. **Paratypes:** 3♂ 8♀ taken with the types on *Juniperus*. 5♀ Aug. 14, 1925, Mesa Verde National Park, Colorado (H. H. Knight). The following records from the Nevada Test Site: Area 19M, ♀ June 22, ♂ June 23, 1965 (H. H. Knight & J. M.

Merino); Area 401M, ♂ ♀ June 19, 1965, taken on *Juniperus osteosperma*; Area 17M, ♂ June 17, 1965, on *Juniperus osteosperma*; Area 18M, 2♀ June 23, 1965 (H. H. Knight & J. M. Merino), taken on *Juniperus osteosperma*; Area EM, ♂ July 26, 1962.

Dichrooscytus cuneatus, new species

Runs in the key to the couplet with *angustifrons*, from which it differs by the wider vertex, smaller size, and red on basal half of cuneus.

Female. Length 3.5 mm, width 1.5 mm. Head: width .92 mm, vertex .37 mm; yellowish. Rostrum, length 1.29 mm, reaching upon apex of hind coxae. Antennae: segment I, length .37 mm, pale yellowish; II, 1.50 mm, cylindrical, slightly more slender near base, pale yellowish; III, .64 mm, dusky; IV, .40 mm, dusky. Pronotum, length .71 mm, width at base 1.29 mm; lateral areas of disk rather strongly rugulose, pale yellowish. Scutellum moderately convex, yellowish, median line reddish on basal half. Dorsal surface clothed with recumbent, yellowish pubescence. Hemelytra pale yellowish, apical margin of corium infuscated; cuneus pallid, reddish on basal half and on apex. Membrane pale fuscous brown, veins pallid. Ventral surface pallid to yellowish, a few small red flecks on sides of venter. Legs pallid to pale yellowish, femora with a few scattered red flecks.

Holotype: ♀ Aug. 13, 1925, Durango, Colorado (H. H. Knight). **Paratype:** ♀ taken with the type.

Dichrooscytus angustifrons, new species

Runs in the key to the couplet with *cuneatus* from which it differs by the narrowed vertex, greater size, and by having reddish only on apex of cuneus.

Male. Length 4.4 mm, width 1.5 mm. Head: width 1.02 mm, vertex .34 mm, frons vertical in position. Rostrum, length 1.36 mm, reaching upon apex of hind coxae. Antennae: segment I, length .41 mm, light green; II, 2.0 mm, cylindrical, pale to dusky; III, .81 mm, dusky; IV, .47 mm. Pronotum, length .68 mm, width at base 1.29 mm; disk minutely rugulose, pallid to greenish. Scutellum yellowish brown. Dorsal surface sparsely clothed with recumbent, pale to golden pubescence. Hemelytra pale yellowish and tinted pink, embolium pale to tinted greenish; cuneus pale, basal half tinted pink, apex and narrow edge as far as brachium, red. Membrane pale fuscous, veins pale except around

smaller areole, where they are red. Ventral surface pale to yellowish; legs pale, sometimes tinted green.

Female. Length 4.0 mm, width 1.6 mm. Head: width 1.0 mm, vertex .40 mm. Rostrum, length 1.36 mm, reaching upon apex of hind coxae. Antennae: segment I, length .42 mm; II, 1.6 mm; III, .71 mm; IV, .40 mm. Pronotum, length .58 mm, width at base 1.26 mm. Color and pubescence very similar to the male.

Holotype: ♂ Aug. 22, 1925, Pingree Park, Colorado (H. H. Knight). **Allotype:** ♀ same data as the type. **Paratypes:** 2♂ 1♀ taken with the types.

Dichrooscytus convexifrons, new species

Keys out in the couplet with *suspectus* Reut., but differs in having the frons strongly convex, so that the base of clypeus is not visible as viewed from above.

Male. Length 4.9 mm, width 2.0 mm. Head: width 1.32 mm, vertex .18 mm; brownish yellow, with fuscous hairs. Rostrum, length 2.0 mm, reaching upon sixth ventral segment, brownish yellow. Antennae: segment I, length .44 mm, yellowish; II, 1.8 mm, cylindrical, a bit more slender on basal half, pale brownish yellow; III, .85 mm, pale to dusky; IV, .64 mm, dusky. Pronotum, length .78 mm, width at base 1.60 mm; disk rather flat, calli moderately convex, pale to brownish yellow; clothed with rather short, sub-erect black bristles. Scutellum moderately convex, yellowish brown, mesonotum more brown. Dorsal surface clothed with rather short, recumbent yellowish pubescence. Hemelytra red to reddish brown, pale to yellowish along claval suture and apex of clavus, embolium pallid or yellowish white; cuneus deeper red, paracuneus pale yellowish. Membrane pale fuscous brown, veins red. Ventral surface pallid to yellowish. Legs rather uniformly pale or pale yellowish.

Female. Length 5.3 mm, width 2.2 mm; costal margin moderately arcuate. Rostrum, length 2.2 mm, reaching upon base of ovipositor. Antennae: segment I, length .51 mm; II, 1.83 mm, more slender on basal half; III, .82 mm, pallid; IV, .61 mm, brownish. More robust than the male but very similar in color and pubescence.

Holotype: ♂ July 31, 1931, Teton National Forest, Wyoming (H. H. Knight). **Allotype:** ♀ same data as the type. **Paratypes:** 2♂ 3♀ taken with the types.

Dichrooscytus vittatipennis, new species

Allied to *suspectus* Reut., with the long rostrum reaching almost to base of genital segment; with a black vitta superimposed upon a red wedge-shaped area of corium; inner margin of corium and the paracuneus clear translucent.

Male. Length 5.2 mm, width 2.1 mm. Head: width 1.46 mm, vertex .78 mm; brownish yellow, frons smooth and shining. Rostrum, length 2.8 mm, reaching to base of genital segment. Antennae: segment I, length .44 mm, yellowish; II, 1.97 mm, cylindrical, slender, more slender on basal half; III, broken. Pronotum, length .92 mm, width at base 1.73 mm; disk smooth and shining, calli defined by impressed line, clothed with very fine, short recumbent pubescence. Scutellum convex, pale yellowish, with very fine short pubescence. Hemelytra clothed with recumbent, simple, golden yellow pubescence; red, embolium and wide outer margin of clavus pallid to yellowish, wide inner margin of corium and the paracuneus, pallid translucent; inner two-thirds of clavus red, blackish bordering apical half of scutellum; corium with a black wedge superimposed over the wedge-shaped red of the corium; cuneus bright red, narrow outer margin and inner basal angle joining with paracuneus, clear translucent; membrane uniformly fuscous, veins pale yellowish. Legs uniformly pallid pale yellowish; tibial spines yellowish brown, tips of tarsi fuscous. Genital segment and the claspers typical of the genus.

Holotype: ♂ July 10, 1965, Kyburz, California (H. H. Knight), sweeping on conifers.

Dichrooscytus suspectus Reuter

Dichrooscytus suspectus Reuter, 1909:37.
Dichrooscytus suspectus Knight, 1941:165.

This is a widely distributed species, breeding on *Pinus resinosa* and *P. virginiana* in the eastern states and other pines in the west. I have definite records from Pingree Park, Colorado; Yellowstone National Park, Wyoming; and Lake Tahoe, California (H. H. Knight).

Dichrooscytus rufipennis (Fallen)

Lygaeus rufipennis Fallen, 1807:84.
Dichrooscytus rufipennis Fieber, 1858:21.
Dichrooscytus rufipennis Knight, 1941:165.

This species is so closely related to one or more species from the western United States that it seems desirable to place it in the key for separation of the species. It definitely occurs in

North America as I have found it breeding on *Pinus sylvestris* in New York, but I have not seen specimens from the western states as yet.

Dichrooscytus ruberellus, new species

Allied to *rufipennis* (Fallen), but differs in the shorter rostrum and smaller size.

Male. Length 3.7 mm, width 1.4 mm. Head: width .86 mm, vertex .34 mm; yellowish red. Rostrum, length 1.4 mm, reaching upon the fifth or sixth ventral segment. Antennae: segment I, length .34 mm, brownish yellow; II, 1.49 mm, cylindrical, yellowish brown, darker near apex; III, .64 mm, brownish yellow; IV, .51 mm, dusky. Pronotum, length .58 mm, width at base 1.12 mm; reddish yellow, a shade of green about the calli. Scutellum reddish, paler on base. Dorsal surface clothed with recumbent, golden yellow pubescence. Hemelytra uniformly yellowish red, not paler on paracuneus or cuneus, embolium more yellowish. Membrane uniformly pale fuscous, veins reddish. Ventral surface pale yellowish brown, venter more or less green on the sides. Legs uniformly pale yellowish brown, tips of tarsi darker. Genital segment and claspers typical for the genus.

Female. Length 3.9 mm, width 1.4 mm. Head: width .88 mm, vertex .37 mm. Rostrum, length 1.46 mm, reaching to base of ovipositor. Antennae: segment I, length .32 mm; II, 1.36 mm, slightly more slender on basal half; III, .64 mm, dusky; IV, .48 mm, dusky. Pronotum, length .58 mm, width at base 1.22 mm. Very similar to the male in color and pubescence.

Holotype: ♂ Aug. 22, 1925, Pingree Park, Colorado (H. H. Knight). **Allotype:** ♀ same data as the type. **Paratypes:** 16♂ 19♀ taken with the types on *Juniperus sibirica*, which is the host plant for this species.

Dichrooscytus rainieri, new species

Allied to *rufipennis* (Fallen), but separated in the key by the wider vertex; also by the smaller size and rostrum reaching upon genital segment.

Male. Length 4.7 mm, width 1.9 mm. Head: width 1.19 mm, vertex .60 mm; pale yellowish, with short, erect, black bristle-like hairs. Rostrum, length 2.48 mm, reaching upon base of genital segment. Antennae: segment I, length .34 mm; 1.46 mm, cylindrical, but slightly more slender on basal half, pale yellowish brown; III, .85 mm, yellowish brown; IV, .54 mm, fus-

cous. Pronotum, length .74 mm, width at base 1.49 mm; disk nearly flat, pale to green, clothed with short, black bristle-like hairs. Scutellum pale greenish, sparsely set with short, black bristle-like hairs. Hemelytra reddish, embolium and paracuneus pallid, cuneus light red; clothed with recumbent, yellow to golden, simple pubescent hairs, and sparsely intermixed with erect, short dark hairs. Membrane nearly clear but shaded with dusky brown, veins red. Ventral surface pallid to light yellowish brown. Legs pallid to light dusky brown, front legs with a slight tint of green.

Female. Length 4.7 mm, width 1.9 mm; costal margin moderately arcuate. Head: width 1.15 mm, vertex .62 mm. Rostrum, length 2.5 mm, reaching upon base of eighth ventral segment. Antennae: segment I, length .34 mm; II, 1.42 mm; III, .85 mm; IV, .54 mm. Pronotum, length .74 mm, width at base 1.53 mm. Very similar to the male in color and pubescence, but red coloration a bit paler.

Holotype: ♂ Aug. 14, 1931, Mt. Rainier, Washington (H. H. Knight). **Allotype:** ♀ same data as the type. **Paratypes:** ♂ 7 ♀ taken with the types.

Dichrooscytus latifrons, new species

Runs in the key to the couplet with *adamsi*, but size smaller and more slender, width of vertex greater than half the width of head.

Male. Length 4.8 mm, width 1.6 mm. Head: width 1.02 mm, vertex .55 mm. Rostrum, length 1.9 mm, reaching upon posterior trochanters or to the fourth ventral segment. Antennae: segment I, length .34 mm, yellowish; II, 1.36 mm, cylindrical, slightly more slender near base, pale yellowish, apical fourth brownish; III, .71 mm, dusky; IV, .54 mm. Pronotum, length .64 mm, width at base 1.38 mm; disk transversely rugulose, bearing erect, short brown to black bristles; green to greenish yellow. Scutellum green to yellowish. Hemelytra uniformly medium red, paracuneus scarcely paler, embolium pallid; clothed with recumbent, pale to golden brown pubescence. Ventral surface pale yellowish to greenish. Legs uniformly pale brownish yellow, hairs and spines yellowish brown. Genital segment and claspers typical of the genus.

Female. Length 4.6 mm, width 1.8 mm. Rostrum, length 1.8 mm, reaching to base of ovipositor, brownish yellow. Antennae: segment I, length .34 mm; II, 1.22 mm, cylindrical, more slender on basal half; III, .71 mm; IV, .54 mm.

Pronotum, length .68 mm, width at base 1.42 mm. Very similar to the male in color and pubescence.

Holotype: ♂ Aug. 20, 1925, Pingree Park, Colorado (H. H. Knight). **Allotype:** ♀ same data as the type. **Paratypes:** 3♂ Aug. 12, 1929, San Francisco Mts., ♂ May, 1930, Tucson, Arizona (E. D. Ball).

Dichrooscytus adamsi, new species

Runs in the key to the couplet with *latifrons* from which it differs by larger size; width of vertex subequal to half the width of head.

Male. Length 5.4 mm, width 2.1 mm. Head: width 1.36 mm, vertex .68 mm; clothed with erect, short brown hairs. Rostrum, length 2.1 mm, reaching upon posterior trochanters, or upon the fourth ventral segment. Antennae: segment I, length .44 mm, brownish yellow; II, 1.83 mm, cylindrical, yellowish brown; III, .81 mm, brown; IV, .51 mm. Pronotum, length .78 mm, width at base 1.76 mm; disk rather flat, transversely rugulose, yellowish brown. Scutellum transversely rugulose, brownish yellow. Dorsal surface clothed with recumbent to suberect, simple golden to brown pubescence. Hemelytra reddish to red, embolium and paracuneus yellowish to pallid, cuneus deeper red. Membrane pale fuscous brown, veins reddish brown. Ventral surface uniformly pale yellowish. Legs pallid to very light yellowish brown, tibial spines golden brown.

Female. Length 5.0 mm, width 2.1 mm; costal margin slightly arcuate. Head: width 1.4 mm, vertex .74 mm. Rostrum, length 2.1 mm, reaching to base of ovipositor. Antennae: segment I, length .40 mm; II, 1.73 mm, slightly more slender on basal half; III, .88 mm; IV, .61 mm. Pronotum, length .84 mm, width at base 1.8 mm. Very similar to the male in color and pubescence.

Holotype: ♂ July 15, 1932, Mt. Adams, Washington (A. R. Rolfs). **Allotype:** ♀ same data as the type. **Paratypes:** 5♂ 2♀ taken with the types.

Dichrooscytus pinicola, new species

In the key this species runs in the couplet with *delecticus*, but differs in the narrower vertex, which in width does not equal half the width of head; paracuneus white, apical margin of corium fuscous.

Male. Length 4.5 mm, width 1.8 mm. Head: width 1.22 mm, vertex .54 mm. Rostrum, length

2.1 mm, reaching upon sixth ventral segment. Antennae: segment I, length .44 mm, yellowish; II, 1.77 mm, cylindrical, yellowish; III, .85 mm, pale to dusky; IV, .40 mm, dusky. Pronotum, length .74 mm, width at base 1.52 mm; pallid to yellowish, calli slightly darker. Scutellum moderately convex, pale yellowish, tinted pink. Dorsal surface clothed with recumbent, fuscous to yellowish simple pubescence, more fuscous hairs on head and pronotum. Hemelytra pale yellowish, a touch of pink in the hypodermis, apical margin of corium fuscous brown; paracuneus white, cuneus reddish pink, paler on outer margin. Membrane clouded with fuscous brown, veins reddish brown, apex of brachium white. Ventral surface pallid to pale yellowish, sides of venter showing some pink. Legs pallid, tibial spines brownish, tips of tarsi fuscous. Genital segment and claspers typical of the genus.

Holotype: ♂ June 23, 1965, Area I9M, Nevada Test Site (H. H. Knight & J. M. Merino), taken on *Pinus monophylla*. **Paratype:** ♂ same data as type.

Dichrooscytus delecticus, new species

Runs in the key to the couplet with *pinicola*, from which it differs in having the paracuneus tinted reddish orange; veins about the areoles reddish brown.

Male. Length 4.9 mm, width 1.9 mm. Head: width 1.10 mm, vertex .54 mm. Rostrum, length 1.97 mm, reaching upon fifth ventral segment. Antennae: segment I, length .34 mm, yellowish brown; II, 1.63 mm, cylindrical, more slender on basal half, pallid, apical half brownish to dark brown on apex; III, .74 mm, fuscous brown; IV, .64 mm, fuscous. Pronotum, length .72 mm, width at base 1.46 mm; disk white, tinged with yellow, pigment appears leached out across basal area. Scutellum white, tinged or scortched with brown. Head, pronotum, scutellum and corium, sparsely set with short, suberect, dark bristle hairs; hemelytra somewhat shining, clothed with more recumbent brownish pubescence. Hemelytra with whitish, opaque pigment in hypodermis, much of it leached out so what remains appears coagulated, the whole being stained with reddish orange; the overall effect suggests the bugs had lived in a hot, arid situation. Membrane uniformly fumate, veins reddish brown. Ventral surface dusky white. Legs pallid, tarsi dusky, apical tarsal segment fuscous.

Holotype: ♂ July 29, 1931, Medicine Bow Mts., Wyoming (H. H. Knight). **Paratypes:** 4♂

taken with the type, probably sweeping pines or Juniper, although I am unable to recall the exact habitat, for it was a brief stop along the highway in a hot arid situation.

Dichroscytus barberi Knight

Dichroscytus barberi Knight, 1925:95.

Length 4.4 mm, width 2.3 mm. Dorsal surface light brownish yellow; scutellum with a triangular reddish mark each side just before apex; corium with a reddish band across apical margin; veins of membrane and apex of cuneus, red. Known from the Huachuca Mts., Arizona.

Dichroscytus vittatus Van Duzee

Dichroscytus vittatus Van Duzee, 1921:122.

Length 5.0 mm, width 2.0 mm. Rostrum reaching upon sixth ventral segment. Hemelytra with a fuscous band across apex of corium; cuneus pallid, apex red; veins in the membrane, red.

Described from Huntington Lake, Fresno County; Fallen Leaf Lake, Eldorado County; and Lake Tahoe, California.

Dichroscytus apicalis, new species

Runs in the key to the couplet with *vittatus* Van D. from which it differs by having black bristles on head and pronotum; central area of corium and clavus with a group of red dots.

Male. Length 4.1 mm, width 1.7 mm. Head: width 1.15 mm, vertex .57 mm; with short black bristles, frons with arcuate reddish brown lines each side of median line. Rostrum, length 1.9 mm, reaching upon sixth ventral segment. Antennae: segment I, length .34 mm, pale yellowish; II, 1.49 mm, cylindrical, more slender on basal half, pallid; III, .85 mm, dusky; IV, broken. Pronotum, length .68 mm, width at base 1.4 mm; disk pallid to yellowish, calli shaded with brown; with short black bristles intermixed with yellowish to brown recumbent pubescence. Scutellum whitish, tinted pink; mesonotum brownish black. Hemelytra clothed with recumbent, yellowish to brown pubescence; pallid, band across apex of corium, dots and spots on middle of corium, and a few on clavus, reddish brown to purple; paracuneus white; cuneus pale but margins reddish, apex with deep red to black. Membrane nearly clear, veins and more or less each side shaded with fuscous; veins around smaller areole reddish. Ventral surface pallid to reddish brown, sides of venter with reddish brown. Genital segment pale, basal half on each

side brownish black. Legs pallid, femora with small, evanescent reddish brown spots; coxae fuscous at base, front pair more white.

Holotype: ♂ June 19, 1965, Area 401M, Nevada Test Site (H. H. Knight & J. M. Merino), taken on *Juniperus osteosperma*.

Dichroscytus junipericola, new species

Runs in the key to the couplet with *utahensis*, but distinguished by having reddish band across apical margin of corium, also irregularly red on middle of clavus.

Female. Length 5.0 mm, width 2.0 mm. Head: width 1.36 mm, vertex .68 mm; yellowish brown. Rostrum, length 2.2 mm, reaching to base of ovipositor, yellowish brown, apex black. Antennae: segment I, length .47 mm, yellowish; II, 1.88 mm, cylindrical, slightly more slender on basal half, pale yellowish; III, .85 mm, pallid to dusky; IV, .51 mm, dusky. Pronotum, length .86 mm, width at base 1.7 mm; pallid to pale yellowish brown. Scutellum moderately convex, yellowish brown. Dorsal surface clothed with recumbent to suberect, fuscous hairs on head and pronotum, and hemelytra with recumbent, simple yellowish pubescence. Hemelytra pale yellowish, a reddish band across apical margin of corium, also irregularly red on middle, the clavus with reddish near apex of scutellum; cuneus red, lateral margin pale, paracuneus yellowish white. Membrane nearly clear, but tinted with dusky brown; veins red, apical curve of brachium white. Ventral surface and legs pale yellowish, tibial spines brownish, tips of tarsi fuscous.

Holotype: ♀ June 19, 1965, Area 401M, Nevada Test Site (H. H. Knight & J. M. Merino), taken on *Juniperus osteosperma*. **Paratype:** ♀ June 23, 1965, Area 19M, Nevada Test Site (H. H. Knight & J. M. Merino), taken on *Juniperus osteosperma*.

Dichroscytus utahensis, new species

Runs in the key to the couplet with *junipericola*, but distinguished by the uniformly pink clavus and corium; vertex (♂) just equal to one-third the width of head.

Male. Length 4.1 mm, width 1.4 mm. Head: width .96 mm, vertex .32 mm; pallid, eyes brownish black. Rostrum, length 1.36 mm, reaching to base of hind trochanters. Antennae: segment I, length .41 mm, greater than width of vertex, pale yellowish; II, 1.77 mm, cylindrical, slightly more slender at base, pallid; III, broken.

Pronotum, length .64 mm, width at base 1.22 mm, pallid to pink. Scutellum moderately convex, pink. Dorsal surface clothed with recumbent to suberect, yellowish to golden simple pubescence. Hemelytra pink, the color arising from fine granular dots in the hypodermis, embolium paler; cuneus pink, an oblique pale area bordering or separating the pink area from the bright red apical edge. Membrane uniformly clear, veins red, posterior bend of brachium nearly white, but flecked with red. Ventral surface pallid to white. Legs pallid to pale yellowish, tibial spines golden brown.

Holotype: ♂ Aug. 15, 1930, Richfield, Utah (E. W. Davis), taken in light trap. **Paratype:** ♂ same data as the type.

Dichrooscytus minimus, new species

Runs in the key to the section where the rostrum extends beyond posterior trochanters; differs from allied species by the small size, narrow vertex, hemelytra tan colored, without marks or dots.

Male. Length 3.0 mm, width .68 mm. Head: width .95 mm, vertex .30 mm; eyes large. Rostrum, length 1.36 mm, reaching upon seventh ventral segment. Antennae: segment I, length .37 mm, yellowish; II, 1.46 mm, cylindrical, pallid to pale yellowish; III, .61 mm, pale; IV, .44 mm, dusky. Pronotum, length .58 mm, width at base 1.10 mm, pale yellowish, calli not outlined. Scutellum pale yellowish. Dorsal surface clothed with recumbent, pale yellowish simple pubescence. Hemelytra tan colored, embolium paler, cuneus with narrow red apex; membrane pale fumate, vein about apex of smaller aerole, red. Ventral surface and legs pale yellowish.

Holotype: ♂ Aug. 4, 1917, Williams, Arizona (H. H. Knight).

Genus *Bolteria* Uhler

Bolteria junipcri, new species

Fig. 252

Allied to *amicta* Uhler, but differs in lacking a lunate black ray behind the calli; also differs in having outer half of clavus and inner half of corium, white.

Male. Length 4.7 mm, width 1.7 mm. Head: width .36 mm, vertex .65 mm; reddish, vertex and bordering eyes in front, white, reddish brown behind carina edge of vertex. Rostrum, length 2.3 mm, reddish to fuscous, reaching upon base of genital segment. Antennae: seg-

ment I, length .44 mm, pallid to dusky; II, 1.9 mm, slender, cylindrical, a trifle thinner near base, pallid to yellowish, pubescence minute; III, .85 mm, dusky; IV, .51 mm, pale fuscous. Pronotum, length .81 mm, width at base 1.46 mm; minutely punctate, with short minute pale pubescence; disk creamy white, calli and anterior angles reddish brown, collar black, basal margin shaded with fuscous. Scutellum convex, white, basal area with a few reddish brown dots and vermiculate marks on median area; mesonotum reddish brown. Hemelytra reddish brown to fuscous brown on apical area of corium, inner half of corium as far as tip of clavus, and outer half of clavus except base, opaque white; margins of the dark area breaking into flecks and dots where joining the white areas; clothed with minute, appressed, simple pubescent hairs; cuneus white, apex and narrow outer margin reddish brown, more blackish on apex. Mem-

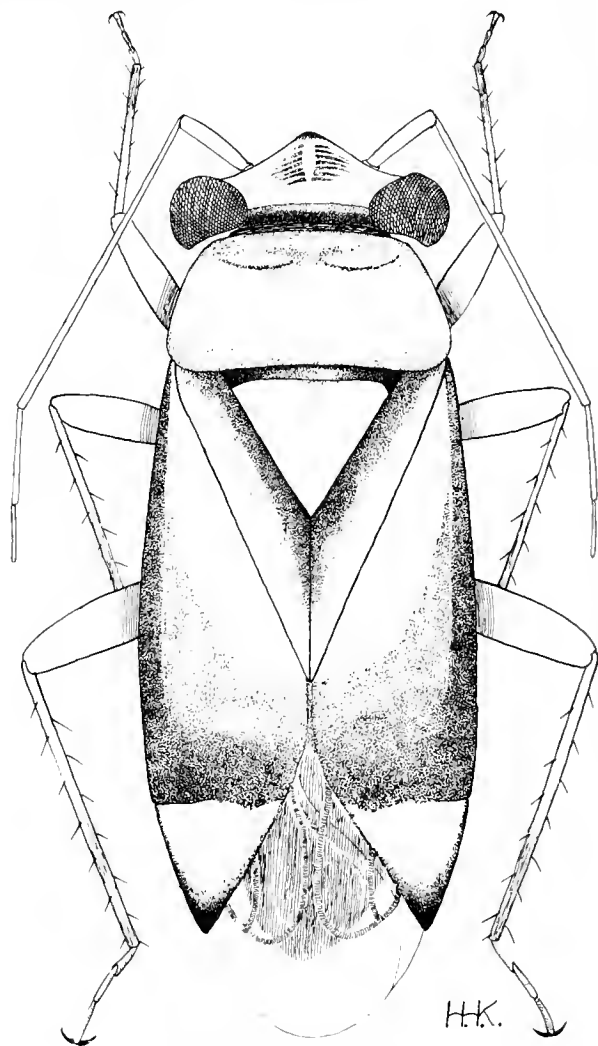


Fig. 252. *Bolteria junipcri*, ♂.

brane pale fuscous, paler on central area, veins reddish, paler around apex of larger areole. Dorsal aspect and the body moderately shining, pubescence inconspicuous. Ventral surface reddish brown, strongly shining, propleura and epimeron white. Legs white, tarsi dusky, tibial spines yellowish brown.

Female. Length 4.6 mm, width 1.8 mm. Head: width 1.46 mm, vertex .74 mm; fuscous brown, vertex and frons pallid, frons with transverse reddish brown lines. Rostrum, length 2.4 mm, reaching upon eighth ventral segment, reddish brown. Antennae: segment I, length .41 mm, pallid; II, 1.87 mm, slender, pallid; III, .68 mm; IV, .47 mm. Pronotum, length .85 mm, width at base 1.5 mm. Slightly more robust than the male, but very similar in color and pubescence.

Holotype: ♂ June 20, 1965, Scipio, Utah (H. H. Knight). **Allotype:** ♀ taken with the type. **Paratypes:** ♂ 5 ♀ taken with the types on *Juniperus osteosperma*, which is the host plant. 2♂ 1♀ June 23, 1965, Area 19M, Nevada Test Site (H. H. Knight & J. M. Merino), taken on *Juniperus osteosperma*. ♂ June 16, alt 8000 ft, near Grand Canyon, Arizona.

Concerning the host plant, all specimens of this species were taken only on small trees, five to seven feet in height. Extensive collecting on the larger *Juniperus osteosperma* trees yielded eleven other species of Miridae, but not a single specimen of *B. juniperi* on the large, old trees.

Bolteria speciosa (Van Duzee)

Dichrooscytus speciosus Van Duzee, 1916:236.

Bolteria speciosa Knight, 1920:127 (1919).

Bolteria speciosa Knight, 1928:131, key.

Records: 2♀ June 23, 1965, Area 19M, Nevada Test Site (H. H. Knight & J. M. Merino), taken on *Juniperus osteosperma*. The types came from G. Alpine Creek, Tahoe, California (E. P. Van Duzee). 2♂ 2♀ July 27, 1932, Fallen Leaf Lake, near Lake Tahoe, California (R. L. Usinger), taken on *Juniperus*.

Genus *Stenotus* Jakovlev

Stenotus binotatus (Fabricius)

Lygaeus binotatus Fabricius, 1794:172.

Phytocoris binotatus Fallen, 1829:78.

Oncognathus binotatus Fieber, 1861:246.

Stenotus binotatus Reuter, 1888:636, syn.

Stenotus binotatus Van Duzee, 1917:323, cat.

Stenotus binotatus Knight, 1923:614.

Stenotus binotatus Knight, 1941:175.

Stenotus binotatus Carvalho, 1959:254, cat.

Known distribution: Utah, Idaho, Oregon, Washington, Idaho, Colorado, and eastern states. **Host plants:** orchard grass (*Dactylis glomerata*), timothy (*Phleum pratense*), and to some extent other grasses.

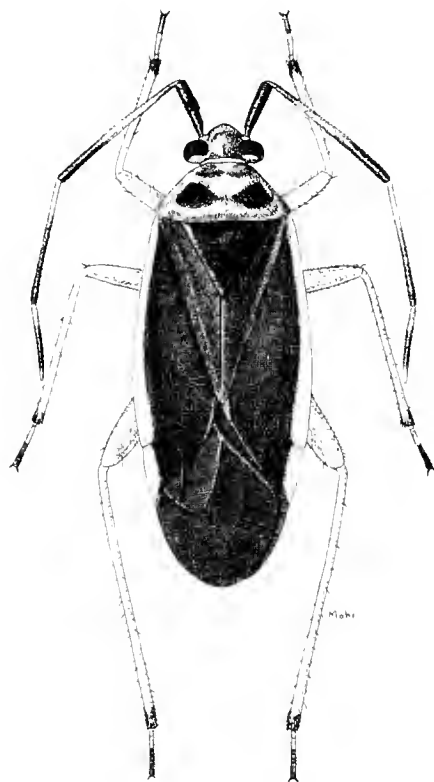


Fig. 253. *Adelphocoris rapidus* (Say). ♀.

Genus *Adelphocoris* Reuter

Adelphocoris superbus (Uhler)

Calocoris superbus Uhler, 1875:838, Pl. 42, Fig. 3.

Adelphocoris superbus Tucker, 1907:60.

Reported from western states: Arizona, California, Nevada, Utah, Colorado, Idaho, Wyoming, Kansas, New Mexico, and Texas. This species must occur on the test site, but I was unable to find it.

Genus *Calocoris* Fieber

Calocoris fasciiventris Stal

Calocoris fasciiventris Stal, 1862:320.

Calocoris palmeri Uhler, 1872:410.

Calocoris fasciiventris Knight, 1927:43.

This species is known from Arizona and Colorado.

Genus *Poecilocapsus* Reuter

Poecilocapsus nigriger (Stal)

Brachycoleus nigriger Stal, 1862:19.

Poecilocapsus nigriger Van Duzee, 1917:336, cat.

Known from Los Angeles County and Whittier, California, taken on *Salvia apiana* by E. L. Paddock.

Genus *Horcias* Distant

Horcias dislocatus (Say)

Capsus dislocatus Say, 1832:393.

Horcias dislocatus Carvalho, 1959:100.

Known from Colorado, Texas and states to the east.

Horcias sexmaculatus (Barber)

Poecilocapsus sexmaculatus Barber, 1906:280.

Known from Colorado, Oklahoma, and Texas. Breeds on *Rudbeckia columnaris*.

Genus *Creontiades* Distant

Key to the Species

1. Length of first antennal segment not equal to width of head; rostrum not surpassing the hind coxae 2
- Length of first antennal segment exceeding width of head; rostrum extending beyond tips of hind coxae; ♂, length 6.8 mm *rubrinervis* Stal
2. Width of vertex subequal to twice the width of first antennal segment; ♂, length 7.8 mm *femoralis* Van D.
- Width of vertex greater than twice the width of first antennal segment; ♂, length 6.8 mm *debilis* Van D.

Creontiades femoralis Van Duzee

Creontiades femoralis Van Duzee, 1914:19.

Male. Length 6.8 mm. Head: width 1.26 mm, vertex .39 mm. Antennae: segment I, length 1.09 mm, width .20 mm. Rostrum, length 2.5 mm, reaching upon apex of middle coxae. This species is known from San Diego County, California.

Creontiades rubrinervis (Stal)

Megacochum rubrinervis Stal, 1862:32.

Creontiades rubrinervis Distant, 1883:237, Pl. 23, Fig. 12.

Male. Length 6.8 mm. Head: width 1.12 mm, vertex .37 mm. Antennae: segment I, length 1.19 mm, width .17 mm; II, 2.9 mm. Rostrum, length 2.8 mm, reaching upon posterior trochanters.

This species is known from Arizona, Texas, Florida, and Mexico.

Creontiades debilis Van Duzee

Creontiades debilis Van Duzee, 1915:111.

Creontiades debilis Knight, 1927:43, host.

This species is known from Florida, Georgia,

Mississippi, and Texas. Breeds on *Daubentonia longifoliae*; also reported as a pest of cotton.

Genus *Garganus* Stal

Garganus splendidus Distant

Garganus splendidus Distant, 1893:429, Pl. 37, Fig. 9.

This colorful species may be distinguished by the red orange color, with collar and scutellum greenish white; length of first antennal segment exceeding width of head by half the dorsal width of an eye.

Records: ♂ ♀ Oct., 1928, Santa Cruz County (A. A. Nichol); ♂ ♀ Aug. 1, 1924, Patagonia (E. P. Van Duzee); ♂ ♀ Aug. 23, 1937, Nogales, Arizona (C. J. Drake & F. Andre).

Genus *Ganocapsus* Van Duzee

Ganocapsus filiformis Van Duzee

Ganocapsus filiformis Van Duzee, 1912:481.

I have specimens of this species from Tucson, Nogales, Rincon Mts., and Patagonia, Arizona, where A. A. Nichol found it breeding on *Amaranthus palmeri*.

Genus *Stittocapsus* Knight*Stittocapsus franseriae* Knight

Fig. 22

Stittocapsus franseriae Knight, 1942:156.

This species was described from Mohawk, Arizona (L. L. Stitt), where the bug was breeding on *Franseria dumosa* Torr. This species of plant is at the test site, occurring around Mercury, Rock Valley, Jackass Flats and Frenchman Flat (Beatley, 1965), so the bug may well occur at the test site.

Genus *Closterocoris* Uhler*Closterocoris amoenus* (Provancher)

Fig. 20

Pycnopterna amocna Provancher, 1887:114.*Closterocoris ornata* Uhler, 1890:77.*Closterocoris amoenus* Van Duzee, 1912:321.*Closterocoris amoenus* Van Duzee, 1917:367.

This species is common in the southern half of California and could easily occur in southern Nevada. It was reported as occurring in the eastern part of the United States and Canada in the early records, but I have never found this species among material collected in the eastern states during the past fifty years. It raises the question as to whether some early specimens were mislabeled as to the place of origin.

Genus *Ectopiocerus* Uhler*Ectopiocerus anthracinus* Uhler*Ectopiocerus anthracinus* Uhler, 1890:73.*Ectopiocerus anthracinus* Reuter, 1912:33.

Records from California: Los Angeles County (Coquillett); Sequoia Nat. Park (J. C. Bradley); Kaweah river, alt. 6000 ft (E. L. Diven); Tuolumne County (Nunenmacher); ♂ ♀ June 20, 1926, Fresno (C. J. Drake).

Genus *Dacerla* Bergroth*Dacerlo inflata* (Uhler)*Myrmecopsis inflatus* Uhler, 1894:277.*Dacerla inflata* Bergroth, 1897:95.*Dacerla inflata* Carvalho, 1959:350.

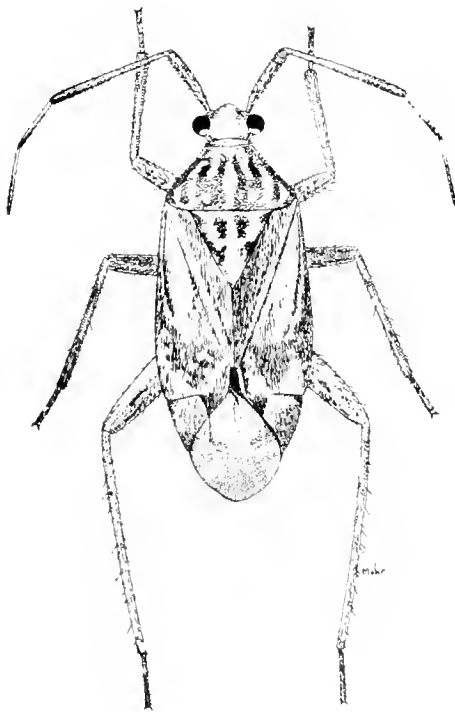
Records from California: ♂ ♀ July 10, 1915, Tahoe (E. P. Vanduzee); ♀ May 17, 1931, Calaveras County (R. L. Usinger), on *Lupinus*; ♂ ♀ July 23, 1929, Eldorado County (R. L. Usinger); ♂ ♀ July 4, 1935, Albolado (E. L. Paddock), on *Lupinus andersonii*.

Genus *Cyphopelta* Van Duzee*Cyphopelta modesta* Van Duzee

Fig. 21

Cyphopelta modesta Van Duzee, 1910:81.

Records for California: Los Angeles County (Coquillett); Stanford University Arboretum (H. Morrison); Cypress Ridge, Marin County (E. C. Van Dyke).

Fig. 254. *Taedia salicis* (Kngt.). ♀.Genus *Notholopus* Bergroth*Notholopus californicus* (Knight)*Calocorisca californicus* Knight, 1933:69.*Notholopus californicus* Carvalho, 1955:224.

This species was described from San Bernardino and Tulare counties, California, and not since reported elsewhere.

Genus *Pycnocoris* Van Duzee*Pycnocoris ursinus* Van Duzee

Pycnocoris ursinus Van Duzee, 1914:24, n. gen., n. sp.

This species is known from La Jolla, San Diego, and Alpine, California.

Genus *Lampethusa* Distant

Lampethusa anatina Distant

Lampethusa anatina Distant, 1884:303, Pl. 29, Fig. 13; Pl. 45I, n. sp., (1893).

This species is known from Arizona and Texas.

Lampethusa nicholi Knight

Lampethusa nicholi Knight, 193:71.

This species is known from Arizona and Texas.

Genus *Taedia* Distant

Taedia parenthesis (Knight)

Paracalocoris parenthesis Knight, 1930:817.

Taedia parenthesis Carvalho, 1959:262.

The species is known only from Arizona.

Taedia virgulatus (Knight)

Paracalocoris virgulatus Knight, 1930:820.

Taedia virgulatus Carvalho, 1959:263.

This species is known only from Arizona.

Genus *Neurocolpus* Reuter

Key to the Species

- 1. Antennal segment I widest at the inflated apex 2
 - Antennal segment I not inflated nor wider at apex 9
- 2. Rostrum reaching beyond middle coxae 3
 - Rostrum just attaining posterior margin of middle coxae; color uniformly yellowish or fulvous *simplex* Van D.
- 3. Length of antennal segment I less than half the length of segment II 4
 - Length of antennal segment I equal to or greater than half the length of segment II 5
- 4. Hind tibiae with reddish band on base and at middle; cuneus reddish to strongly red *montanus*, n. sp.
 - Hind tibiae with a dark band only on base; cuneus yellowish to brownish *stitti*, n. sp.
- 5. Length of antennal segment I equal to half the length of segment II, or less 6
 - Length of antennal segment I equal to more than half or about three-fifths the length of segment II; coloration varied with fuscous and black, with pale spots present in the dark areas *mexicanus* Dist.
- 6. Dorsal surface uniformly dark reddish brown, unspotted; apical one-third of scutellum white or yellowish *johnstoni* Kngt.
 - Scutellum and pronotal disk with reticulate pattern of fuscous and brown 7
- 7. Length of antennal segment I subequal to width of head 8
 - Length of antennal segment I clearly less than width of head, falling short by half the dorsal width of an eye; antennal segment II dusky brown, darker brown on apical half *nicholi*, n. sp.
- 8. Pronotal disk and scutellum strongly marked with a reticulate pattern of fuscous brown; frons with strong oblique and transverse lines *chiricalhuae*, n. sp.

- Pronotal disk and scutellum pallid, scutellum with small black dots across middle; frons with lines obsolete *obsoletus*, n. sp.
9. Rostrum not reaching beyond apex of hind coxae 11
Rostrum reaching beyond hind coxae, or upon fourth ventral segment 10
10. Antennal segment I equal to three-fourths the length of segment II; hind tibiae pallid, with basal one-fourth dark colored *tiliae* Kngt.
Antennal segment I equal to three-fifths the length of segment II; hind tibiae pale but with two bands of dark color *longirostris*, n. sp.
11. Length of antennal segment I exceeding width of head 12
Length of antennal segment I not equal to width of head *arizonae* Kngt.
12. Length of antennal segment I less than two-thirds the length of antennal segment II 13
Length of antennal segment I about two-thirds the length of segment II *nubilus* Say
13. Hind femora pallid, with apical one-fourth black *jessiae* Kngt.
Hind femora fuscous or reddish on basal half and the apical half likewise *rubidus* Kngt.

Neurocolpus simplex Van Duzec
Neurocolpus simplex Van Duzec, 1918:281.
Known from Coachella, California, where Van Duzec collected it on Palo-Verde, *Cerci-*

dium torreyanum. Other record: 2 ♀ April 26, 1916, Sabino Canyon, Santa Catalina Mts., Arizona (J. F. Tucker).

Neurocolpus arizonae Knight

Neurocolpus arizonae Knight, 1934:163.
Known from Arizona, Utah, New Mexico, and Texas. Host plant is *Prosopis juliflora*. Record: taken on mesquite June 30, 1965, St. George, Utah (H. H. Knight).

Neurocolpus mexicanus Distant

Neurocolpus mexicanus Distant, 1883:263, Pl. 23, Fig. 5.
Known from Arizona, Texas, and Mexico. Records: ♀ June 1, 1926, alt. 6000 ft., Chiricahua Mts., Arizona (A. A. Nichol). ♂ June 22, 1908, ♀ Nov. 22, 1910, Brownsville; ♂ ♀ June 8, 1963, McAllen; ♀ June 5, 1963, Mission (J. Hannah); ♂ April 15, 1936, Dimit, Texas (S. E. Jones).

Neurocolpus nubilus (Say)

Capsus nubilus Say, 1832:22.
Neurocolpus nubilus Carvalho, 1959:172.
This species is known from Colorado, New Mexico, Texas and all states eastward.

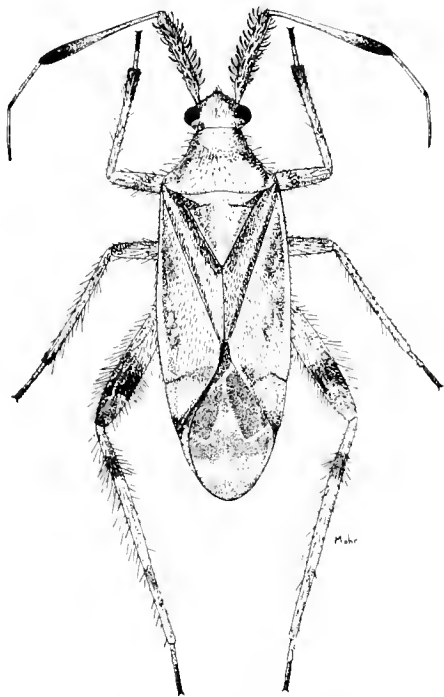


Fig. 255. *Neurocolpus tiliac* Kngt., ♂.

Neurocolpus montanus, new species

Allied to *mexicanus* Distant, but distinguished as shown in the key.

Male. Length 6.1 mm, width 2.38 mm. Head: width 1.09 mm, vertex .44 mm; pallid, marked and shaded with reddish brown, frons with oblique and transverse red lines. Rostrum, length 2.1 mm, reaching upon middle of hind coxae. Antennae: segment I, length 1.15 mm, somewhat flattened, apex inflated (width .34 mm), tapering to more narrow at middle (width .27 mm), reddish to reddish brown, paler on ventral aspect, the reddish color forming a network to separate numerous white spots; clothed with erect bristle hairs and thickly intermixed with flattened, black scale-like hairs, which are wider on apical half; II, 2.3 mm, brownish yellow, apical half red to reddish brown, cylindrical, apical half gradually thicker, thickness (.15 mm) near apex about equal to thickness of fore tibia on basal half; III, .68 mm, white, apical half infuscated; IV, .54 mm, fuscous. Pronotum, length 1.3 mm, width at base 2.1 mm; collar flat, reddish disk pale to reddish brown; clothed with erect pale to brownish bristles, basal half with about 12 tufts of erect black hairs. Scutellum darkened with reddish brown, apex white; also bearing erect long hairs. Dorsal surface clothed with pale to golden, suberect simple hairs and intermixed with shorter, recumbent to appressed, golden sericeous pubescence. Hemelytra dark reddish brown, embolium with several whitish spots, apical half of corium, and clavus bordering scutellum, shaded with black; cuneus red, darker on base and apex. Membrane fuscous, a clear spot at each side behind areoles, veins red, blackish on basal half. Ventral surface chiefly red, red granules visible in the hypodermis. Legs red, femora with numerous pale spots, tibia pallid, basal one-fourth reddish, a narrow red band on base of apical half; femora thickly clothed with erect, golden and black bristle hairs, apical one-third intermixed with some flattened black hairs; tibiae with erect, long bristles and hairs. Genital segment and claspers typical of the genus, not showing external specific characters.

Female. Length 6.4 mm, width 2.4 mm. Head: width 1.15 mm, vertex .47 mm; pallid, marked with reddish brown, frons with several oblique to transverse lines. Rostrum reaching to middle of hind coxae. Antennae: segment I, length 1.15 mm, apex (width .37 mm) inflated as in the male; pallid, reticulate with reddish, with erect bristles and flattened hairs as in the

male; II, 2.3 mm, cylindrical, slender on basal half, apical half gradually thickened as in the male; III, .75 mm, pale fuscous; IV, .58 mm, fuscous. Pronotum, length 1.36 mm, width at base 2.0 mm. Color more reddish brown than the male; pubescence similar to the male.

Holotype: ♂ June 26, 1926, alt. 5000 ft, Santa Rita Mts., Arizona (A. A. Nichol). **Allotype:** ♀ taken with the type. **Paratypes:** ♂ taken with the types. 2 ♂ July 18, 1917, Goudy Creek Canyon, Arizona (H. H. Knight). ♂ June 7, 1926, alt. 4500 ft, Tucson, Arizona (A. A. Nichol). ♂ July 5, 1926, alt. 8000 ft, Rincon Mts., Arizona (A. A. Nichol).

Neurocolpus stitti, new species

Allied to *montanus* but differs in having dark band at base of hind tibia but without a band on middle; the dark color brown rather than fuscous, reddish brown on cuneus.

Male. Length 6.1 mm, width 2.2 mm. Head: width 1.05 mm, vertex .44 mm; pallid, with weak brown lines on frons. Rostrum, length 2.2 mm, barely surpassing middle coxae and reaching to middle of hind coxae. Antennae: segment I, length 1.12 mm, width on apex .37 mm, narrowing from there to base, apex somewhat inflated, nearly glabrous, elsewhere clothed with erect brown bristles, and intermixed with golden brown flat hairs which are wider on apex, color dark brown but spotted and marked with pale; II, 2.45 mm, cylindrical, slender on base and gradually thickened to apex, clavate on apical one-third, pallid to yellowish, apical half becoming dark reddish brown, with pubescence very short and inconspicuous; III, .74 mm, pale, apical half infuscated; IV, .64 mm, pale fuscous. Pronotum length 1.25 mm, width at base 1.87 mm, pale yellowish, basal half of disk shaded with fuscous, bearing tufts of erect black hairs. Scutellum pale yellowish, marked with fuscous dots across middle. Dorsal surface clothed with pale to golden, erect simple hairs and thickly intermixed with more recumbent and appressed, golden sericeous pubescence. Hemelytra pale yellowish, shaded and marked with dark brown; corium, inner half of clavus bordering scutellum, and spots on embolium darker brown; cuneus yellowish brown, apex and spot on paracuneus dark brown. Membrane fuscous, a large pale spot by apex of cuneus; veins fuscous brown, brachium more yellowish about apex of larger areole. Ventral surface pale yellowish. Legs pale yellowish, hind femora shaded and marked with brown on apical half; front

and middle femora spotted with brown on apical one-third; femora with long erect hairs, hairs arising in the dark brown areas also dark; hind tibiae pallid to yellowish, dark brown only on basal one-fourth, bearing erect long golden bristles and spines. Genital segment and claspers distinctive of the genus, but not showing distinctive specific characters externally.

Female. Length 6.2 mm, width 2.4 mm. Head: width 1.05 mm, vertex .47 mm; pallid, oblique and transverse lines on frons rather weak. Antennae: segment I, length 1.09 mm, width of inflated apex .36 mm, narrowing toward base, bristles and hairs as in the male; II, 2.28 mm; III, .71 mm; IV, .64 mm. Pronotum, length 1.4 mm, width at base 1.97 mm. Very similar to the male in color and pubescence.

Holotype: ♂ June 1, 1941, Pinal Mountain, Arizona (L. L. Stitt). **Allotype:** ♀ same data as the type. **Paratypes:** 3♂ taken with the types. ♂ June 1, 1926, alt. 8000 ft, Chiricahua Mts., Arizona (A. A. Nichol).

Neurocolpus nicholi, new species

Runs in the key near *chiricahuae* and *obsoletus* but differs from both by the short first antennal segment, which in length is not equal to width of head.

Male. Length 5.4 mm, width 2.1 mm. Head: width 1.02 mm, vertex .44 mm; frons with oblique and transverse lines, lower half of head also marked with brown lines. Rostrum, length 2.0 mm, just reaching to base of hind coxae. Antennae: segment I, length .88 mm, slightly wider (.27 mm) at the inflated apex, but tapering gradually narrower to base, pale yellowish, marked with dots and irregular lines; II, 1.77 mm, yellowish brown, apical half moderately incrassated and dark brown; III, .54 mm, yellowish brown; IV, .51 mm, dusky brown. Pronotum, length 1.22 mm, width at base 1.87 mm; pallid, lightly shaded with irregular patches and dots of brown; basal half of disk with several tufts of erect black hairs. Scutellum pallid, shaded and marked with irregular patches and marks of brown. Hemelytra pallid, shaded and marked with patches of fuscous brown, the dark areas spotted with pale; embolium pallid, spotted and marked with dark brown; cuneus dark brown, paler on outer margin. Membrane pale translucent, shaded and marked with fuscous, darker within areoles, veins pallid about apex of larger areole. Dorsal surface clothed with suberect to erect, pale to golden simple

bristle hairs and thickly intermixed with recumbent to appressed golden sericeous pubescence. Ventral surface pallid to yellowish, venter more yellow. Legs pallid to pale yellowish, hind femora marked with a reticulate pattern of brown marks and dots; tibiae yellow, hind pair shaded with brown on base; femora and tibiae bearing erect, long pilose hairs, pallid to golden in different lights; tibiae bristles obscured and intermixed with erect hairs. Genital segment and claspers distinctive of the genus, but not providing good external specific characters.

Holotype: ♂ May 4, 1926, alt. 2700 ft, Santa Catalina Mts., Arizona (A. A. Nichol). Named for the collector, Mr. Andrew A. Nichol, who did important ecological work with plants and animals of Arizona.

Neurocolpus chiricahuae, new species

Runs in the key to the couplet where first antennal segment is subequal to width of head; pronotum and scutellum with a reticulate pattern of dark brown.

Male. Length 6.4 mm, width 2.2 mm. Head: width 1.08 mm, vertex .44 mm; frons with strong oblique and transverse lines. Rostrum, length 2.1 mm, reaching base of hind coxae. Antennae: segment I, length 1.05 mm, apex moderately inflated, wider (.31 mm) here than at middle (.27 mm); ground color pallid and marked with a reticulate pattern of dark brown; clothed with erect golden bristles, and intermixed with flat, dark brown scalelike hairs which are wider on apical half. Segment II, 2.1 mm, cylindrical, narrow at base, but gradually widened to incrassate on apical one-third where the color is dark brown; III, .64 mm, pale to fuscous; IV, .61 mm, pale fuscous. Pronotum, length 1.42 mm, width at base 2.0 mm; disk with a reticulate pattern of dark brown over a paler ground color; basal half of disk with several small tufts of dark brown hairs. Scutellum with an irregular reticulate pattern of dark brown over a paler ground color. Dorsal surface clothed with erect, pale to golden simple hairs, and intermixed with recumbent and appressed golden sericeous pubescence. Hemelytra dark brown, clavus and embolium with a few pallid spots and flecks; cuneus reddish to dark brown. Membrane pale fuscous brown, a large pale spot behind tip of cuneus and apex of areoles, veins reddish to dark brown. Ventral surface pale yellowish and marked with reddish brown; sides of venter more strongly marked with dots and spots of

reddish brown. Genital segment and claspers follow a generic pattern.

Holotype: ♂ June 20, 1928, alt. 6200 ft, Chiricahua Mts., Arizona (A. A. Nichol).

Neurocolpus obsoletus, new species

In the key this species runs in the couplet with *chiricalhuae*, but differs in the pallid color, pronotum without reticulate color pattern.

Female. Length 5.9 mm, width 2.4 mm. Head: width 1.09 mm, vertex .47 mm; pale yellowish, without strong marks or lines. Rostrum, length 2.1 mm, pallid, reaching upon middle of hind coxae. Antennae: segment I, length 1.05 mm, inflated on apex (width .34 mm) and tapers gradually narrower to base, pallid, dorsal aspect of the inflated apex dark brown, basal half with a fine lined reticulate pattern of brown; clothed with erect pale bristles and intermixed with erect, dark brown flat scalelike hairs which are wider on apical half. Segment II, length 1.94 mm, cylindrical, slender on basal half, yellowish brown, apical half gradually tapering thicker, incrassate and dark brown; III, .68 mm, pale yellowish; IV, .58 mm, pale yellowish. Pronotum, length 1.36 mm, width at base 2.10 mm; pallid to pale yellowish, without dark marks or shading; bearing pale bristle hairs intermixed with darker hairs on basal half of disk, some groups of which form tufts. Scutellum pallid, shaded brown on base, with a group of small brown dots strung across middle of disk. Hemelytra pallid and shaded with pale yellowish brown, inner half of clavus and apical half of corium shaded to dark brown, the darker areas invaded by pale spots and dots, cuneus pallid, with dark brown narrowly across base and the apex darker brown. Membrane pale fuscous brown, darker within areoles, veins yellowish except base of brachium. Dorsal surface clothed with suberect pale hairs, intermixed with appressed, golden yellow sericeous pubescence. Ventral surface pale yellowish, without marks or dark shading. Legs pallid, hind femora with three irregular patches of dark brown on apical half, bearing dark and light colored erect hairs, but shorter and more sparsely set compared with related species.

Holotype: ♀ May 27, 1928, alt. 3300 ft, Rincon Mts., Arizona (A. A. Nichol).

Neurocolpus longirostris, new species

Runs in the key to a couplet with *tiliae* Kngt., as both species have the rostrum extending be-

yond the hind coxae; distinguished by the shorter first antennal segment and posterior tibiae having two dark annuli.

Male. Length 6.3 mm, width 2.2 mm. Head: width 1.05 mm, vertex .47 mm; pallid to yellowish, lines on frons nearly obsolete. Rostrum, length 2.6 mm, reaching beyond hind coxae to fifth ventral segment, pallid, apex dark brown. Antennae: segment I, length 1.32 mm, not inflated at apex, width at middle .31 mm, somewhat flattened, narrow width .18 mm, pale to yellowish brown, paler beneath, sides showing spots and flakes of lighter color; clothed with erect brown bristles, intermixed with erect, flattened, brown scalelike hairs, that are wider on apical half; II, 2.2 mm, cylindrical, incrassated on apical half to nearly twice thickness at base, bearing short pubescence, yellowish, apical half dark reddish brown; III, .78 mm, pallid, apical half reddish brown; IV, .64 mm, fuscous, narrowly white at base. Pronotum, length 1.19 mm, width at base 1.8 mm; pallid, darkened by an irregular, reticulate pattern of light brown, larger pale areas near median line and on calli; basal half of disk with several small tufts of dark brown hairs, the tufts not as dense or with as many hairs as found in other species. Scutellum pallid to light brown, the pale color appears to come from deposits of material in the hypodermis. Hemelytra light brown, marked with many pallid spots on clavus and corium, the light spots arise from pigment in the hypodermis; embolium pallid put broken by light brown areas; cuneus pallid, apex and spot on paracuneus reddish brown. Membrane fuscous brown, a large pale spot behind apex of cuneus and extending behind larger areole, brachium whitish, darker on basal half. Dorsal surface clothed with erect to suberect, simple, pale to golden hairs and intermixed with shorter, appressed and recumbent silvery to golden sericeous pubescence. Ventral surface pale to yellowish and light brown. Legs pale, hind femora darkened by a reticulate pattern of light brown; hind tibiae with brown spots and marks covering basal one-fourth; clothed with erect brown hairs that obscure or become confused with the true spines.

Female. Length 6.7 mm, width 2.4 mm. Head: width 1.08 mm, vertex .50 mm. Antennae: segment I, length 1.50 mm, width at middle .34 mm; II, 2.4 mm, incrassated apical half slightly more than twice thickness at base; III, .81 mm; IV, .75 mm. Pronotum, length 1.39 mm, width at base 2.0 mm. Somewhat more

robust than the male, but very similar in coloration and pubescence.

Holotype: ♂ July 6, 1937, Dayton, Washington (R. E. Miller). **Allotype:** ♀ same data as the type. **Paratypes:** 3♂ taken with the types. ♂ ♀ July 10, ♀ July 28, 1937, alt. 4747 ft, Dayton, Idaho (R. E. Miller). ♂ July 31, 1920, Missoula, Montana (A. A. Nichol). 2♀ July 20, 1925, Yellowstone National Park, Wyoming (A. A. Nichol).

Neurocolpus tiliae Knight
Fig. 255

Neurocolpus tiliae Knight, 1934:162.

Known from Minnesota, Iowa, Kansas, and Texas.

Neurocolpus rubidus Knight

Neurocolpus rubidus Knight, 1934:164.

Known from Texas, Kansas, Illinois, Michigan, Ohio, New York, and Maryland.

Neurocolpus jessiae Knight

Neurocolpus jessiae Knight, 1934:163.

Breeds on Elder (*Sambucus* sps.) Known from Texas, Mississippi, Missouri, Illinois, Iowa, Wisconsin, and New York.

Neurocolpus johnstoni Knight

Neurocolpus johnstoni Knight, 1934:166.

At present known only from Texas.

Genus *Phytocoris* Fallen

Key to the Sections

- 1. Second antennal segment uniformly colored, pallid, white, yellow, dark brown or black; without a distinct white band at base Section A, p. 211
- Second antennal segment with one or more pale to white bands or annuli 2
- 2. Second antennal segment with one pallid or white band at base only Section B, p. 218
- Second antennal segment with more than one pale band or annulus 3
- 3. Second antennal segment with two pale or white annuli, not counting incomplete pale spots on dorsal aspect of basal half 4
- Second antennal segment with three or more pale or white annuli Section D, p. 255
- 4. Dorsal surface with deciduous black or brownish black, scalelike hairs intermixed with other types of pubescence Section C, p. 236
- Dorsal surface without deciduous black scalelike hairs Section CC, p. 247

Genus *Phytocoris* Fallen

Key to the Species, Section A

- 1. Length of antennal segment I subequal to, or longer than width of pronotum at base 2
- Length of antennal segment I not equal to width of pronotum 9
- 2. Body and dorsal surface thickly covered with appressed, silvery scalelike hairs 3
- Body and dorsal surface not covered with appressed, silvery scalelike hairs 4
- 3. Antennal segment I thickly set with long white hairs on ventral surface to form a brush; color uniformly pallid or white; length 4.9-5.4 mm *candidus* Van D.

- Antennal segment I without a thick brush of hair on ventral surface; pronotal disk yellowish to red; scutellum fuscous, also with fuscous lines formed on claval vein, radial vein and more widely along inner margin of corium; length 5.9-6.3 mm *squamosus* Kngt.
4. Frons black; antennal segment I with fuscous spots on dorsal surface; femora with a reticulate pattern of fuscous marks; length 8.1 mm *nigrifrons* Van D.
- Frons not black 5
5. Scutellum and pronotal disk with a pallid or white median line, roseate bordering this line, the reddish color stronger over hemelytra in the male; female brachypterous, paler in color, hemelytra tinted with roseate; length (♀) 7.3 mm, (♂) 8.5 mm *roseipennis* Kngt.
- Scutellum and pronotum without indication of a pale median line 6
6. Dorsal surface and hind femora with a strong and regular reticulate red pattern; basal edge of pronotum pallid, under lining a transverse subbasal line of black spots which bear tufts of flat black hairs; length 6.8-7.3 mm *rufoscriptus* Van D.
- Dorsal surface and hind femora without a reticulate red pattern 7
7. Cuneus with reddish 8
- Cuneus pallid to fuscous; antennae pale dusky yellow, segment I with paler spots; male genital segment and claspers distinctive (Fig. 261); length 6.6 mm *tenuis* Van D.
8. Pronotal disk chiefly red; femora red, pale dots minute; male genital segment and claspers distinctive (Fig. 256); length 7.1 mm *cunealis* Van D.
- Pronotal disk pale to yellow, reddish brown on sides and base; femora reddish brown, with large and small white dots and spots; male genital segment and claspers distinctive (Fig. 258); length 7.5 mm *fuscognatus* Kngt.
- 9(1). Legs and antennae with sparsely set, long erect hairs; length of hairs more than twice thickness of tibia; scutellum black, edges of the black cut by pale spots on margins; female brachypterous, length 5.6 mm, male 6.2 mm *longihirtus*, n. sp.
- Without long erect hairs 10
10. Hemelytra green, finely flaked with pallid or dusky 11
- Hemelytra not green, or if so, smooth green without flakes 13
11. Cuneus or areole veins reddish 12
- Cuneus and veins not reddish; hemelytra uniformly pale greenish, flaked with white, veins pallid or green; length 4.7-5.7 mm *consors* Van D.
12. Cuneus reddish, areole veins pallid; length 4.6 mm *cuneotinctus* Kngt.
- Cuneus reddish on apical half, areole veins red; length 6.1 mm *geniculatus* Van D.

13.	Dorsal surface bearing deciduous, black, scalelike hairs, intermixed with simple and sericeous pubescence	14
	Dorsal surface without deciduous, black scalelike hairs	15
14.	Length of antennal segment I subequal to width of head; length 3.7-3.9 mm	<i>ventralis</i> Van D.
	Length of antennal segment I not equal to width of head; length 4.1-4.2 mm	<i>ephedrae</i> Kngt.
15.	Scutellum with a small round black spot each side before apex	16
	Scutellum without black spot each side before apex	18
16.	Dorsal surface pallid, tinted pink, reddish on cuneus; scutellum more strongly convex on apical half; length 6.1-6.8 mm	<i>interspersus</i> Uhler
	Dorsal surface not pink or cuneus reddish	17
17.	Dorsal surface pale yellow; deeper yellow on clavus, apical area of corium, apical half of cuneus and on femora; length 7.0-8.5 mm	<i>laevis</i> Uhler
	Dorsal surface pallid to dusky; femora dusky to pale fuscous, irrorate with paler spots; length 8.5-8.8 mm	<i>rolfsi</i> Kngt.
18.	Hemelytra clear yellowish green; membrane with conspurcate and vermiculate dark fuscous markings; pronotal disk shaded with black, clothed with sericeous white pubescence, intermixed with fuscous and black hairs; femora reddish to dusky orange; length 6.2-6.5 mm	<i>becki</i> , n. sp.
	Otherwise colored	19
19.	Length of antennal segment I not exceeding width of head	25
	Length of antennal segment I greater than width of head	20
20.	Cuneus shaded or marked with red	21
	Cuneus not marked with red	22
21.	Cuneus and paracuneus solid red; pronotal disk red, yellowish between the calli; first antennal segment thick, scarcely more slender on apical half; length (♀) 4.9 mm	<i>rubroornatus</i> Kngt.
	Cuneus yellowish, only flecked and spotted with red; pronotal disk fuscous, margins shaded with reddish black; first antennal segment thicker near base and tapering more slender on apical half; length (♀) 4.7 mm	<i>pulchellus</i> Kngt.
22.	First antennal segment pallid, not marked or shaded with fuscous	23
	First antennal segment shaded or marked with fuscous	24
23.	Rostrum reaching upon seventh or eight ventral segments; femora uniformly dusky brown, not irrorate or spotted; length (♀) brachypterous 6.7 mm, (♂) 7.0 mm	<i>longirostris</i> Kngt.
	Rostrum shorter, just reaching upon fourth ventral segment; femora light fuscous brown, irrorate with pale spots, one large pale area at middle of apical half; length 6.8-7.6 mm	<i>seminotatus</i> Kngt.

24. Antennal segment I pallid, blackish on ventral surface; scutellum blackish, median line and a stripe each side pallid; hemelytra brownish black, inner margins of clavus, outer margins of corium, embolium and cuneus, pallid; membrane uniformly fuscous; length 7.8 mm *fuscipennis* Kngt.
- Antennal segment I fuscous, above irrorate with pale spots; scutellum black, lateral margins with four or five pallid spots; hemelytra pallid, thickly reticulate and conspurate with brownish black; membrane fuscous, apical half with paler areas; length (♂) 6.1 mm *reticulatus*, n. sp.
- 25 (19). Rostrum reaching behind posterior coxae, or to middle of venter; length 4.7-5.6 mm *ramosus* Uhler
- Rostrum not reaching behind posterior coxae 26
26. Dorsal surface without black bristles intermixed with golden yellow simple hairs 27
- Dorsal surface with black bristles intermixed with suberect golden yellow simple hairs; color deep green; length 4.8-5.2 mm *nigripubescent* Kngt.
27. Cuneus and areole veins red; hind femora light reddish brown, irrorate with pale spots; length 4.7 mm *vanduzeei* Reut.
- Cuneus and veins not red; femora and body rich golden yellow, not irrorate; length 4.9 mm *vividus* (Uhler)

Phytocoris becki, new species

Fig. 259

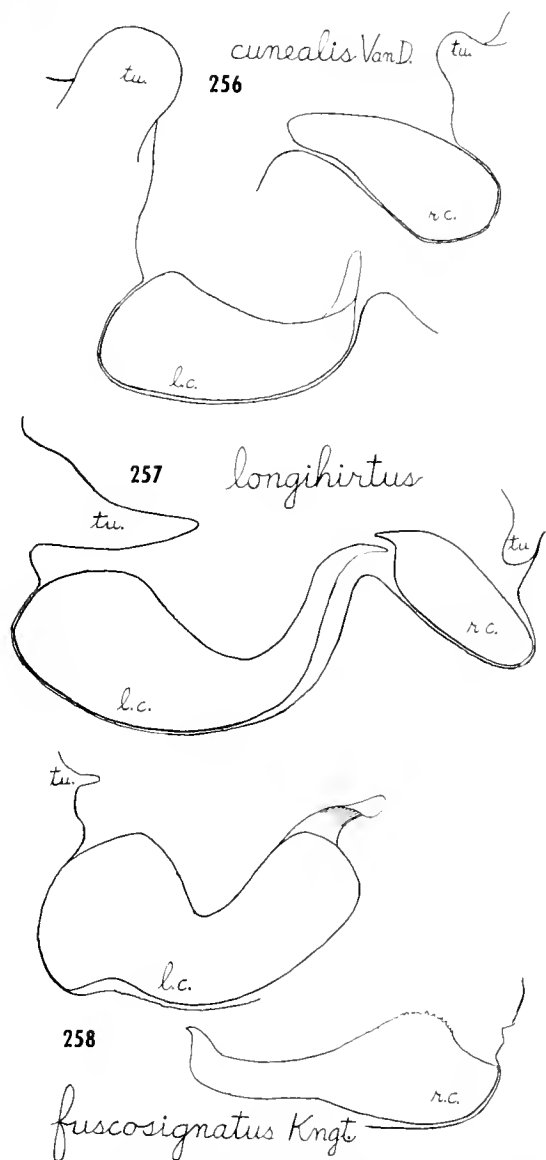
Distinguished by the beautiful light yellowish green color of the hemelytra, reddish orange femora, pallid and blackish pronotum, and uniformly yellowish brown antennae (frontispiece).

Male. Length 6.3 mm, width 2.2 mm. Head: width 1.15 mm, vertex .51 mm; yellowish white, eyes dark brown, collum brownish red above; clypeus yellowish, apical half with red on median line. Rostrum, length 2.6 mm, reaching upon fifth ventral segment, pale yellowish, apical half becoming brownish black. Antennae: segment I, length 1.05 mm, slightly thicker (.18 mm) on basal half, brownish yellow, clothed with suberect and recumbent golden yellow hairs, sparsely intermixed on dorsal aspect with erect yellowish bristles, the length of which do not equal thickness of segment; II, 3.2 mm, cylindrical, just half as thick as segment I, uniformly yellowish brown, clothed with short, minute dusky pubescence; III, 1.66 mm, pale brownish yellow; IV, .91 mm, dusky yellow. Pronotum, length .98 mm, width at base 1.87 mm; pallid to white, margins of disk, median line and collar, dark fuscous to black, propleura white but with a reddish bar across middle of coxal cleft; disk and collar clothed with suberect and recumbent, fuscous to brownish black pubescence, intermixed on the black areas with spots, also a solid

line on collar and median line of disk, with recumbent sericeous white pubescence. Mesoscutum moderately exposed, reddish orange, fuscous on middle, clothed with recumbent sericeous white pubescence. Scutellum yellowish to reddish orange, basal half with sericeous white pubescence.

Hemelytra uniformly light yellowish green, clothed with simple and sericeous, recumbent, pallid to golden yellow pubescence; cuneus uniformly yellowish green like the corium, not darker on apex. Membrane opaque white, somewhat dusky yellow on basal half; apical half strongly marked with reticulate, conspurcate and vermiculate patterns of fuscous and black, leaving a small white spot at tip of cuneus; veins concolorous with the dusky yellowish brown of the areoles. Ventral surface pallid to yellowish green, mesosternum reddish brown; venter yellowish green, broadly reddish orange beneath and on sides, genital segment more yellowish beneath. Legs pallid, coxae nearly white, hind pair marked with red; femora reddish orange, spines pallid; tarsi pale to fuscous and brown. Genital segment and claspers distinctive of the species (Fig. 259).

Female. Length 6.1 mm, width 2.2 mm. Head: width 1.17 mm, vertex .58 mm. Rostrum, length 2.7 mm, reaching upon fourth ventral segment. Antennae: segment I, length 1.09 mm, thickness .20 mm; II, 3.0 mm; III, 1.4 mm; IV,



Figs. 256-258. Male claspers. 256, *Phytocoris cunealis* Van D.; 257, *P. longihirtus*; 258, *P. fuscognatus* Kngt.

missing. Pronotum, length 1.02 mm, width at base 1.93 mm. Very similar to the male in color and pubescence.

Holotype: ♂ June 14, 1965, Tippipah Springs, Nevada Test Site (D E. Beck, H. H. Knight & J. M. Merino), taken on *Ephedra nevadensis*, host plant of the species. **Allotype:** ♀ same data as the type. **Paratypes:** 22 ♂ 6 ♀ collected with the types on *Ephedra nevadensis*. Area 401M, ♀ June 18, ♂ ♀ June 19, 5 ♂ 9 ♀ June 20, 1965, all taken on *Ephedra nevadensis*; Area 17M, ♂ June 16, 1965; Area 18M, 2 ♂ June 11, ♂ July 7, 1965; Area 19M, 2 nymphs June 23, 1965, on *Ephedra nevadensis*;

Area CT, 2 ♂ June 20, 1965; Area CM ♂ June 13, 1965, Nevada Test Site.

This species is named for Dr. D Elden Beck, whom I have known since he was a graduate student at Iowa State University, when he took my course in systematic entomology. He and Dr. D. M. Allred are in charge of some ecological studies being carried out by Brigham Young University, under contract with the Atomic Energy Commission. He collected the first specimens of this species that I ever saw, and when he called me to take a look, I knew at once it was the most beautiful *Phytocoris* I had ever seen. I am indebted to Dr. Beck for the opportunity of working on the Miridae of the test site, a project that has culminated in the present publication.

Phytocoris candidus Van Duzee

Pallacocoris candidus Van Duzee, 1918:288.

Known only from California.

Phytocoris squamosus Knight

Phytocoris squamosus Knight, 1934:11.

Known from Arizona, California and Nevada. Record from the test site: Area 17M, 2 ♂ Aug. 8, 1865, taken at black light.

Phytocoris nigrifrons Van Duzee

Phytocoris nigrifrons Van Duzee, 1920:352.

Known only from California.

Phytocoris roseipennis Knight

Phytocoris roseipennis Knight, 1934:3.

Known only from Arizona.

Phytocoris rufoscriptus Van Duzee

Phytocoris rufoscriptus Van Duzee, 1914:15.

Known from San Diego and Los Angeles Counties, California.

Phytocoris tenuis Van Duzee

Fig. 261

Phytocoris tenuis Van Duzee, 1920:341.

Known from the Santa Cruz Mts. and Tuolumne County, California.

Phytocoris cunealis Van Duzee

Fig. 256

Phytocoris cunealis Van Duzee, 1914:16.

Known from San Diego, Tulare and Los Angeles Counties, California.

Phytocoris fuscusignatus Knight
Fig. 258

Phytocoris fuscusignatus Knight, 1928:45.
Known from Oregon.

Phytocoris cuncotinctus Knight

Phytocoris cuncotinctus Knight, 1925:55.

Originally described from Arizona and now found at the test site: Area CM, 4♂ 4♀ June 12, 1965, Nevada Test Site, taken on *Atriplex canescens*. New record for Utah: 2♂ 6♀ June 30, 1965, St. George (H. H. Knight).

Phytocoris geniculatus Van Duzee

Phytocoris geniculatus Van Duzee, 1918:286.

Originally described from California and now found at the test site: Area 401M, ♀ June 14, ♂ June 18, 1965, taken on *Grayia spinosa*.

Phytocoris ventralis Van Duzee

Phytocoris ventralis Van Duzee, 1918:287.

Originally described from California, and now known from the test site: Area JA, ♂ July 20, 1962, at black light; Area CB, ♀ Aug. 7, 1964, at black light; Area 410M, ♂ July 21, 1965, at black light; Area M, ♀ Aug. 15, 1965, at incandescent light.

Phytocoris ephedrac Knight

Phytocoris ephedrac Knight, 1961:478.

Known from Arizona and Texas, and now taken at the test site: Area CM, ♀ June 13, 1965, on *Ephedra nevadensis*; Area 401M, 3♂ 1♀ June 20, 1965, on *Ephedra nevadensis*; Area 18M, ♀ July 22, 1965, at black light.

Phytocoris consors Van Duzee

Phytocoris consors Van Duzee, 1918:287.

Known from California and Nevada; now found at the test site: Area 16M, 5♂ 2♀ June 24, 1965, on *Atriplex canescens*; Area 17M, 3♀ Aug. 25, 1965, on *Atriplex canescens*; Area 18M, ♂ ♀ June 23, 1965, on *Atriplex canescens*; ♂ ♀ July 7, 1965, on *Atriplex canescens*; ♂ July 22, 1965, at black light; Area 401M, ♀ June 20, ♂ June 22, on *Atriplex canescens*; Area ECB, ♂ Aug. 3, 1962, at black light.

Phytocoris interspersus Uhler

Phytocoris interspersus Uhler, 1895:32.

Known from Arizona, California, Utah, Colo-

rado, New Mexico, Idaho, and British Columbia, Canada.

Phytocoris laevis Uhler

Phytocoris laevis Uhler, 1895:33.

Known from Arizona, Utah, New Mexico, Colorado, South Dakota, and Alberta, Canada.

Phytocoris rolfsi Knight

Phytocoris rolfsi Knight, 1934:1.

Known from Oregon and Washington.

Phytocoris rubroornatus Knight

Phytocoris rubroornatus Knight, 1961:482.

Known from Arizona.

Phytocoris longirostris Knight

Phytocoris longirostris Knight, 1934:6.

Known only from Arizona.

Phytocoris fuscipennis Knight

Phytocoris fuscipennis Knight, 1934:5.

Known from Arizona.

Phytocoris seminotatus Knight

Phytocoris seminotatus Knight, 1934:7.

Known only from Arizona.

Phytocoris ramosus Uhler

Phytocoris ramosus Uhler, 1894:252.

Known from Arizona, California, and the test site: Area 5M, ♂ July 20, 1965, at incandescent light. A new record for Utah: 5♂ 4♀ June 30, 1965, St. George (H. H. Knight).

Phytocoris nigripubescens Knight

Phytocoris nigripubescens Knight, 1925:55.

Known from Arizona, Nevada, and Utah. Record from the test site: Area 5M, ♀ June 12, 10♂ 18♀ June 10, 1965, breeding on *Larrea divaricata*; Area C, ♂ June 20, 1965, at incandescent light; Area MD, 14♂ 5♀ May 16, 1961, at black light; Area 5A, 4♂ July 10, 1964, on *Larrea divaricata*; Area 5A, ♀ July 10, 1964, on *Larrea divaricata*.

Phytocoris vividus (Uhler)

Lygus vividus Uhler, 1894:260.

Known from Arizona, California, and Nevada. Test site record: Area 5M, ♂ June 10, 1965.

Phytocoris vanduzeei Reuter

Dichrooscytus marmoratus Van Duzee, 1912: 512 (preoc.).

Phytocoris vanduzeei Reuter, 1912:30.

Known from New Mexico.

Phytocoris reticulatus, new species

Fig. 260

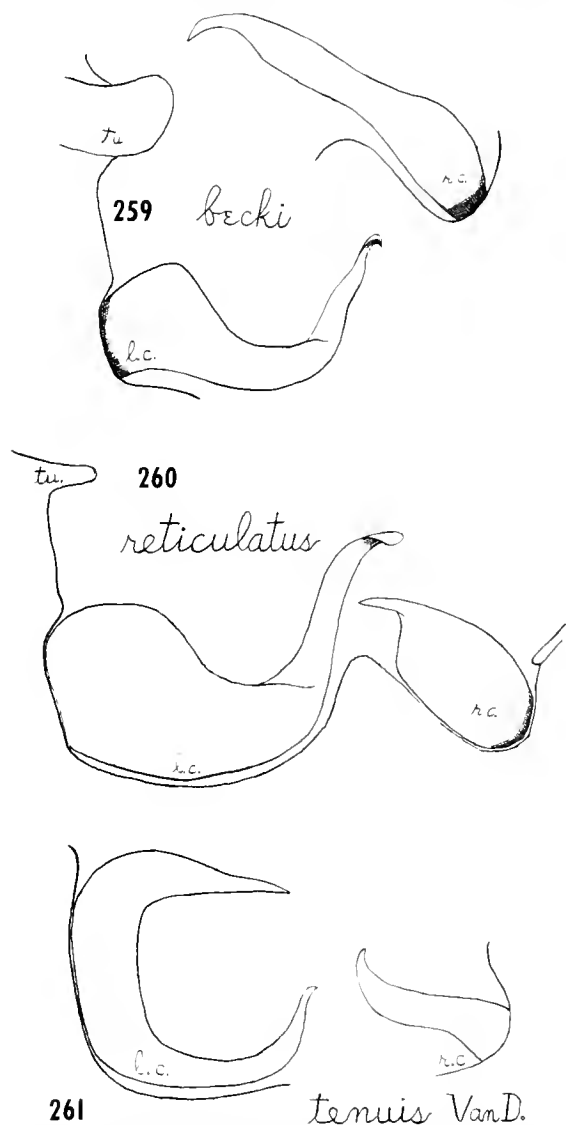
In the key this species runs in the couplet with *fuscipennis* Kngt., from which it may be separated by the black scutellum, pale only on edges where pale spots cut into the black disk.

Male. Length 6.3 mm, width 2.0 mm. Head: width .95 mm, vertex .38 mm; pallid, frons with

transverse brown lines; clypeus with a brownish black U-shaped mark based on middle. Rostrum, length 2.6 mm, reaching upon middle of genital segment, pallid to brownish, apex black. Antennae: segment I, length 1.4 mm, thicker near base, more slender on apical half but enlarged slightly at apex, brownish, pallid beneath, dorsal surface with both pale and brown spots, apex annulate with brown; II, 2.7 mm, cylindrical, uniformly yellowish brown, deeper brown just before apex; III, 1.26 mm, dark brown; IV, missing. Pronotum, length 1.0 mm, width at base 1.8 mm, disk pallid, tinged with brown, anterior angles dark brown; calli moderately convex, basal margin with an impressed dark brown line; propleura pallid, dark brown along dorsal margin, also a dark brown ray across lower half of coxal cleft and extending across middle of propleuron. Mesoscutum broadly exposed, brownish black, a pale spot each side. Scutellum brownish black, basal angles pale, the dark color broken by three pallid spots each side of disk. Hemelytra with pallid base, thickly reticulate and conspurcate with brownish black, inner apical angle of corium darker, a pale spot touching base of cuneus, and cuneus more pallid on base. Membrane pale, apical half with three fuscous spots, vein between areoles dark fuscous. Ventral surface pallid, mesosternum brownish black; lateral line of venter and basal area of genital segment brownish black. Coxae pallid; femora pallid, apical half reticulate with dark brown, leaving base and apex pallid; tarsi dark brown. Genital segment and claspers distinctive, left side of segment with prominent tubercle high above base of left clasper (Fig. 260).

Female. Length 6.6 mm; macropterous, rather similar to the male. Head: width 1.09 mm, vertex .41 mm. Rostrum bent and crumpled, apparently it would reach to middle of ovipositor sheath. Antennae: segment I, length 1.66 mm, dark brown, with three larger pale spots on dorsal aspect; II, 3.2 mm, cylindrical, yellowish brown, slightly darker on apical third; III, 1.5 mm, brownish black; IV, missing. Pronotum, length 1.02 mm, width at base 1.9 mm; basal submargin with several fuscous spots, otherwise like the male. Hemelytra more broadly pallid than the male but with similar reticulate pattern of fuscous brown. This specimen is poorly preserved, apparently having been rescued from a liquid bath.

Holotype: ♂ April 11, 1961, Area CBA 10, Nevada Test Site, taken in a can pit-trap. Allo-



Figs. 259-261. Male claspers. 259, *Phytocoris becki*; 260, *P. reticulatus*; 261, *P. tenuis* Van D.

type: ♀ Oct. 18, 1961, Area CBA 2, Nevada Test Site, taken in a can pit-trap. Paratypes: ♂ Oct. 25, 1961, Area NCB; Area CB A2, 2♂ 1♀ Oct. 23, 1961; Area NCB, ♂ Oct. 18, 1961; Area ACC, ♂ Oct. 9, 1961; Area 12EC10, ♀ Nov. 7, 1961; Area 6CL, ♀ Nov. 6, 1961, all from can pit-traps at the Nevada Test Site.

Phytocoris longihirtus, new species
Fig. 257

Antennae and legs bearing sparsely set long erect hairs, but distinguished from *hirtus* Van D. by the short antennal segment I which in length is subequal to width of head across eyes.

Male. Length 6.5 mm, width 2.4 mm. Head: width 1.2 mm, vertex .51 mm; frons convex, with four or five transverse brown lines each side, with longitudinal, interrupted median line; also a dark sutural line between jugum and lorum. Rostrum, length 2.9 mm, reaching upon fourth ventral segment, pallid to brownish yellow. Antennae: segment I, length 1.2 mm, fuscous brown, pallid beneath, above with three larger and several smaller pale spots, set with several long, erect, yellowish hairs; II, cylindrical, dusky brown, set with some 20 long, erect, yellowish to golden hairs; III, broken, but bearing long, erect hairs. Pronotum, length 1.2 mm, width at base 2.14 mm; disk pallid to dusky brown, bearing several erect long hairs; calli moderately convex, thickly marked with small spots, marks and curved lines, also with irregular marks in front of, and a strong black dot each side of basal margin near inner angle, dark brown. Mesoscutum moderately exposed, brownish black. Scutellum pallid, disk fuscous brown, irregularly marked with pale spots, bearing four or six erect, long hairs. Hemelytra with a pallid background color, shaded and marked with fus-

cous brown, the draker areas irrorate with pale spots, which in some areas may increase in number and size to reduce the dark color into reticulate lines and dots; in this specimen the dorsal surface is badly rubbed but there are indications of long hairs; cuneus marked similarly to the corium. Membrane pallid, marked with dots and spots of fuscous brown, veins pallid and marked with brown. Ventral surface pallid, shaded and marked with fuscous and brown. Legs pallid, coxae with brownish spot near base; femora pallid and marked with brownish; tibiae pallid, with a fuscous brown band each side of middle, also with base and narrow apex shaded darker; tarsi fuscous. Male genital segment and claspers distinctive (Fig. 257).

Female. Length 5.8 mm, width 2.9 mm; brachypterous. Head: width 1.29 mm, vertex .58 mm; frons roundly convex. Rostrum, length 3.0 mm, reaching upon posterior trochanters. Antennae: segment I, length 1.3 mm; II, 2.4 mm; III, .92 mm; .74 mm; all segments sparsely set with erect long hairs. Pronotum, length 1.12 mm, width at base 2.0 mm; calli strongly convex, basal area of disk rather broadly impressed on median line. Hemelytra brachypterous, costal margin broadly arcuate, rounded apically, cuneus indistinct if present, membrane absent; color fuscous brown, having numerous small and large irrorations, in some places broadly expanded and merging into wide pale areas; tip of abdomen exposed, and a few erect long bristles visible. Ventral surface and legs colored like the male; with long bristles on the legs and ventral surface of abdomen.

Holotype: ♂ April 25, 1961, Area JAL10, Nevada Test Site, taken in a can pit-trap. Allotype: ♀ May 18, 1962, Area JAL2, Nevada Test Site, taken in a can pit-trap.

Genus *Phytocoris* Fallen
Key to the Species, Section B

- 1. Legs and antennae clothed with erect, long, sparsely set pallid hairs, length of hairs greater than thickness of segment 2
- Legs and antennae normally clothed with erect hairs, but length of hairs not much greater than thickness of the segment 3
- 2. Antennal segment II brownish yellow, pallid at base; hemelytra pallid, with a round black spot on paracuneus; length 6.1 mm *hirsuticus*, n. sp.
- Antennal segment II pale brownish, fuscous on apex and bordering the basal white annulus; hemelytra with fuscous and black, without a round black spot on paracuneus; length 8.5 mm *hirtus* Van D.

3. Length of antennal segment I subequal to, or greater than, width of pronotum at base	4
Length of antennal segment I not equal to width of pronotum	7
4. Antennal segment I white, black beneath, a full length heavy black line on dorsal aspect; also with black lines on femora and on dorsal surface, over a pallid to white background; length (♂) 7.0 mm, (♀) brachypterous, 5.6 mm	<i>nigrolineatus</i> , n. sp.
Antennal segment I without full length black lines	5
5. Clavus and corium fuscous, but with very few setigerous dots	6
Clavus and corium with numerous, small setigerous fuscous dots, with larger fuscous spots on embolium and cuneus; hind femora fuscous brown, irrorate with numerous small dots and spots; length (♂) 6.3 mm, (♀) brachypterous 4.4 mm	<i>canescens</i> Reut.
6. Dorsal surface with deciduous, black scalelike hairs intermixed with simple hairs and silvery sericeous pubescence; hind femora black above, broken by four large white spots; length 6.1-6.4 mm	<i>angustatus</i> Kngt.
Dorsal surface without deciduous, black scalelike hairs; hind femora without large white spots; length 6.8 mm	<i>formosus</i> Van D.
7. Length of antennal segment I, not equal to width of head	8
Length of antennal segment I, equal to or greater than width of head	15
8. Pronotal disk with basal submarginal band of dark fuscous, sometimes waved, or with blackish spots	10
Pronotal disk without submarginal fuscous band or spots	9
9. Antennal segment I pale yellowish brown, dorsal aspect with four or five pale spots; rostrum reaching to base of genital segment; length 5.1-5.4 mm	<i>mellarius</i> Kngt.
Antennal segment I reticulated with reddish brown, leaving several large white spots; rostrum just reaching upon posterior trochanters; length 4.7-5.4 mm	<i>commulus</i> Kngt.
10. Basal submargin of pronotal disk with a waved fuscous band, the darker points slightly elevated	11
Basal submargin of pronotal disk without a waved band, without elevated points	12
11. Cuneus and apical area of corium reddish; male genital segment without tubercle above base of left clasper; length 3.3-3.5 mm	<i>miniatus</i> Kngt.
Cuneus and corium pallid and with fuscous; male genital segment with a blunt tubercle above base of left clasper; length 3.6-4.3 mm	<i>breviusculus</i> Reut.
12. Basal submargin of pronotal disk with a continuous fuscous band	13
Basal submargin of pronotum with four or six disconnected, nonelevated fuscous spots; rostrum just reaching upon posterior coxae; femora brownish red, irrorate with several white spots; length 5.0 mm	<i>tinctus</i> Kngt.

13. Femora uniformly dark brown, irrorated with a dozen or so small white spots; length 5.8-6.0 mm *umbrosus* Kngt.
 Femora fuscous to black, paler on basal half, marked with both small and large pallid or white spots 14
14. Hemelytra pale fuscous brown, clavus and corium with several pallid or white spots; length 4.9-5.5 mm *stellatus* Van D.
 Hemelytra pallid to fuscous, corium with central area broadly pallid; without smaller white or pallid spots; length 5.8-6.0 mm *simulatus* Kngt.
- 15(7). Length of antennal segment I subequal to width of head 16
 Length of antennal segment I greater than width of head 20
16. Dorsal surface with deciduous, black scalelike hairs intermixed with simple and sericeous white pubescence; femora and hemelytra chiefly pallid, inner apical angle of corium with a wedgeshaped fuscous mark; length 3.7 mm *albellus* Kngt.
 Dorsal surface without deciduous, black scalelike hairs 17
17. Antennal segment I pallid, marked with black spots and reticulations, but the apical one-fourth solid black 18
 Antennal segment I, reddish brown to fuscous, irrorate with pallid and white, the apical one-fourth not solid black 19
18. Rostrum just reaching base of posterior trochanters; male genital segment with a small tubercle above base of left clasper; length 3.4-3.6 mm *breviatus*, n. sp.
 Rostrum reaching upon seventh ventral segment; male genital segment without a tubercle above base of left clasper (Fig. 273); length 4.5 mm *decurvatus*, n. sp.
19. Tibiae, reddish brown to brownish black, irrorate with white spots, not annulate with pale; cuneus and areole veins reddish; male genital segment and claspers distinctive (Fig. 269); length (♂) 5.8 mm *politus* Reut.
 Cuneus and areole veins not reddish; front tibiae pallid, with two fuscous bands, the apex pallid; slender, length 5.8-6.0 mm *maritimus* Van D.
- 20(15). Front tibiae with two or more white annuli 21
 Front tibiae without bands or white annuli 36
21. Color reddish brown over a pallid ground color; cuneus and areole veins brighter red; membrane translucent white, sparsely conspurcate with small fuscous dots; length 5.7-6.0 mm *jucundus* Van D.
 Color not at all reddish 22
22. Front tibiae with a fuscous band on apex 23
 Front tibiae with four fuscous bands, but pallid on apex; slender form, length 5.3 mm *carnosulus* Van D.
23. Dorsal surface without deciduous, black scalelike hairs 24
 Dorsal surface with a scattering amount of deciduous, black scalelike hairs 32

24. Rostrum reaching behind posterior coxae	25
Rostrum just reaching upon middle of hind coxae; head white, without marks or lines; male genital segment and claspers distinctive (Fig. 271); length 7.5 mm	
<i>mcrinoi</i> , n. sp.	
25. Rostrum reaching behind posterior trochanters	26
Rostrum just reaching upon posterior trochanters, or upon fourth ventral segment; head pallid, clypeus with reddish brown V-shaped mark; antennal segment II uniformly yellowish brown, narrowly pale at base; male genital segment and claspers distinctive (Fig. 275)	
<i>stitti</i> Kngt.	
26. Front tibiae with not more than three white annuli, and leaving the apex black	28
Front tibiae with four white annuli, and leaving apex black	
27	
27. Scutellum and mesonotum infuscated, but having the median line pale; antennal segment I fuscous brown, irrorate with pale spots, the apex not darker; male genital segment and claspers distinctive (Fig. 270); length 6.6-6.8 mm	<i>quadriannulipes</i> , n. sp.
Scutellum and mesonotum pallid, but with fuscous on median line and marks elsewhere; antennal segment I with pale spots but apical one-fourth black; male genital segment and claspers distinctive (Fig. 276); length 5.9-6.8	
<i>plenus</i> Van D.	
28. Antennal segment I distinctly thicker on basal half; posterior tibiae yellowish on dorsal surface, reddish brown on ventral surface; genital segment without tubercles; length 4.8 mm	<i>bakeri</i> Reut.
Antennal segment I not distinctly thicker on basal half; posterior tibiae colored otherwise	
29	
29. Middle tibiae banded with fuscous and pale like the front tibiae	30
Middle tibiae not clearly banded with pale and dark color like the anterior tibiae; male genital segment and claspers distinctive (Fig. 283); length 6.8 mm	
<i>piceicola</i> Kngt.	
30. Antennal segment I pallid on ventral aspect	31
Antennal segment I fuscous to black on ventral aspect; scutellum white on basal angles and apex, the pale median line bordered by black which beyond middle spreads laterally to leave the apex white; length 6.4 mm	
<i>angusticollis</i> Kngt.	
31. Slender form; hemelytra pallid, marked with small fuscous dots and reticulations only; male genital segment and claspers distinctive (Fig. 278); length 5.7 mm	<i>gracillatus</i> , n. sp.
Robust form; hemelytra pallid, shaded and marked by large black areas; inner margins of clavus pallid, corium with a large triangular spot on outer apical angle, and a smaller spot on middle, white; length 7.2 mm	
<i>tricinctipes</i> , n. sp.	
32(23). Front tibiae with three distinct pale annuli	33
Front tibiae with two rather incomplete annuli; male genital segment without a distinct tubercle, right clasper distinctive (Fig. 285); (♂) paratype, length 6.2 mm	
<i>fraterculus</i> Van D.	

33. Pronotal discal area paler, median line infuscated, being a forward extension of the basal dark band; basal half of antennal segment II with two or three paler spots just beyond the basal white band 34
 Pronotal disk not showing the median fuscous line 35
34. Length of antennal segment I (46 units) slightly greater than width of head plus width of vertex (44 units); length (♂) 7.9 mm (Fig. 263) *hesperius* Kngt.
 Length of antennal segment I (39 units) not equal to width of head plus width of vertex (41 units); length (♂) 6.6 mm *hesperellus*, n. sp.
35. Femora brownish black, rather uniformly irrorate with small white spots, beneath and above; hind femora with an oblique, subapical white bar on anterior aspect; male genital claspers distinctive (Fig. 266); length (♂), 7.5 mm *heidemanni* Reut.
 Front femora pallid beneath, posterior aspect with two parallel brownish black lines; hind femora with small and large white spots, but not forming a clear cut oblique band; male genital claspers distinctive (Fig. 284), the right clasper extending around to base of left clasper; length 6.1-6.4 mm *cercocarpi* Kngt.
- 36(20). Front tibiae reddish brown, dorsal surface with a row of white spots from base to near apex; scutellum white or yellowish, with a reddish spot each side before apex; length (♀) 6.2 mm *politus* Reut.
 Front tibiae without spots or bands 37
37. Dorsal surface yellowish green, corium along claval suture, and inner apical angle, red; clavus along claval suture and margin bordering scutellum, red; length 6.1-7.1 mm *roseotinctus* Kngt.
 Otherwise colored 38
38. Dorsal surface yellowish green, pronotal disk dusky red; mesoscutum, paracuneus, flecks on cuneus, hind femora except pale spots, red or dusky red; length 5.6 mm *pulchellus* Kngt.
 Otherwise colored 39
39. Dorsal surface brownish red, varied with pale; femora yellowish, marked by reticulate pattern; antennal segment II uniformly yellowish brown, with a narrow white annulus at base; length 6.8 mm *mirus* Kngt.
 Otherwise colored 40
40. Body and dorsal surface uniformly pallid or dull gray, dorsal surface minutely dotted with setigerous dusky dots; embolium with a series of small fuscous spots; antennal segment I white, marked by several brown spots, set with erect white bristles which in length exceed thickness of segment; antennal segment II uniformly dusky yellow, with pallid annulus at base; length 8.1 mm *ingens* Van D.
 Otherwise marked and colored 41
41. Dorsal surface and body covered with appressed, white scalelike hairs; antennal segment I white, marked by a reticulate pattern of black lines and spots; antennal segment II black, a narrow white annulus next to the fuscous

joint; rostrum pallid, reaching upon seventh ventral segment; genital segment and claspers distinctive (Fig. 286); length 5.3 mm

..... *albidosquamus*, n. sp.

Otherwise marked 42

42. Dorsal surface pallid to dusky gray, with a pallid median line on head, pronotum and scutellum; frons distinctly striated; antennal segment I dusky gray, sometimes with pallid spots; antennal segment II uniformly yellowish brown, pallid at base; length (♂) 6.8 mm, (♀) brachypterous, 5.3 mm
..... *validus* Reut.

Otherwise marked 43

43. Antennal segment I uniformly pale yellowish, without spots; dorsal surface pallid, median line of pronotum and scutellum white, bordered each side by pale fuscous lines; length 5.1 mm *flavellus*, n. sp.

Antennal segment I pallid, but marked by small to medium sized fuscous spots 44

44. Rostrum reaching beyond hind coxae; antennal segment I pallid, marked by spots and reticulate pattern of brown; dorsal surface with numerous setigerous fuscous dots; hind femora fuscous brown, irrorate with small pale dots and a few larger white spots; male genital segment distinctive (Fig. 281); length 5.6 mm *varius* Kngt.

Rostrum just reaching upon tips of hind coxae; antennal segment I pallid, with a few pale brownish spots; head and pronotum white, without spots or marks; segment II yellowish brown, with pallid annulus at base; length 7.6 mm *albiceps*, n. sp.

Phytocoris hirtus Van Duzee

Phytocoris comulus Knight

Phytocoris hirtus Van Duzee, 1918:284.
This species is known from southern California—Pasadena and near San Diego.

Phytocoris comulus Knight, 1928:38.
Known from Arizona, Colorado, New Mexico, and Nebraska. Breeds on *Pinus edulis*.

Phytocoris canescens Reuter

Phytocoris hirsuticus, new species

Phytocoris canescens Reuter, 1909:30.
Described from Claremont, California (C. F. Baker). Known from Dan Diego County (Van Duzee), and Berkeley, Sept. 1919 (H. Dietrich).

Runs in the key to the couplet with *hirtus* Van D., but distinguished by the shorter first antennal segment, also by the all pallid color except for the small black spot on paracuneus.

Phytocoris angustatus Knight

Phytocoris angustatus Knight, 1961:483.
Known only from Arizona.

Female. Length 6.1 mm, width 2.4 mm. Head: width 1.08 mm, vertex .47 mm; pallid, eyes brown. Rostrum, length 2.2 mm, reaching to base of posterior trochanters, pallid, apex dark. Antennae: segment I, length 1.3 mm, pallid, thickly clothed with erect long hairs which in length are twice the thickness of segment; II, 2.1 mm, cylindrical, clothed with short pubescence except for a few long erect hairs near base, brownish yellow, pallid at base; III, 1.25 mm, dusky, pale at base; IV, .85 mm, pale dusky brown. Pronotum, length 1.05 mm, width at base 1.83 mm; uniformly pallid like the scutellum.

Phytocoris formosus Van Duzee

Phytocoris reuteri Van Duzee, 1914:18, precoc.
Phytocoris formosus Van Duzee, 1916:37, n. n.
Phytocoris formosus Knight, 1927:44, host.
Known from San Diego County, California.
Host plant is *Adenostegia filifolia*.

Dorsal surface clothed with rather long, erect, simple, pale hairs, intermixed with recumbent, moderately thick, pallid to silvery, sericeous pubescence. Hemelytra pallid, a rounded small black spot on inner or membrane margin of paracuneus. Membrane pale white, rather uniformly sprinkled with very small pale fuscous dots; veins pallid, arcoleos also with the fine dots. Ventral surface uniformly pallid, tinged slightly yellow; venter with erect long hairs. Legs also pallid, clothed with erect long pale hairs, tibial spines and erect hairs longer than elsewhere; tarsi and claws yellowish.

Holotype: ♀ June 20, 1965, Area 401M, Nevada Test Site (H. H. Knight & J. M. Merino), taken on *Atriplex canescens*. **Paratypes:** 3 ♀ taken with the types.

Phytocoris nigrolineatus, new species

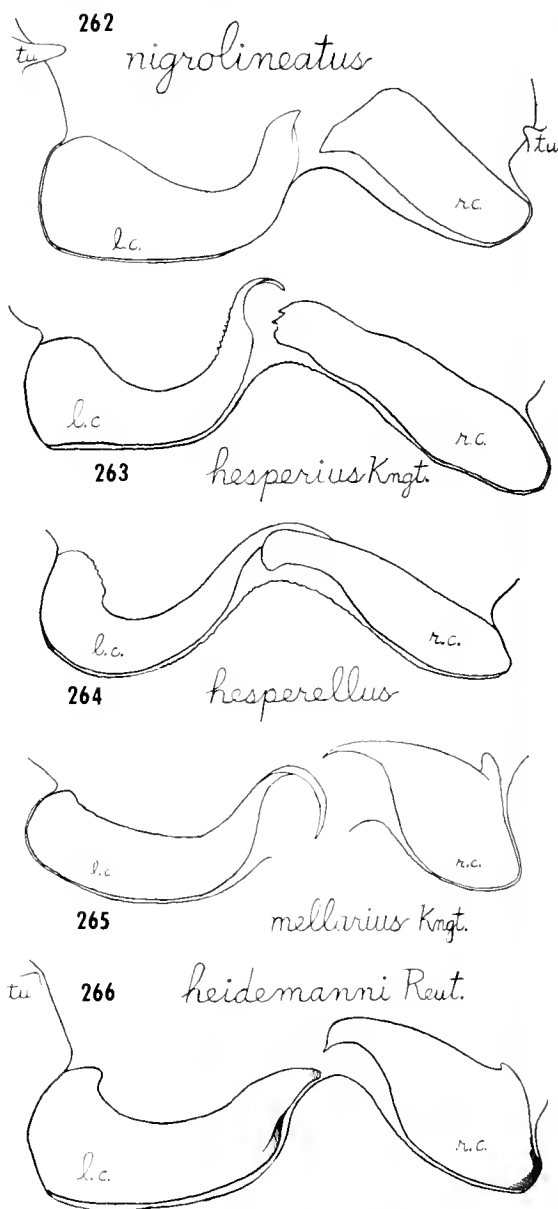
Fig. 262

Distinguished by the long first antennal segment, which in length exceeds width of pronotum at base, white above, with a black line each side that extends full length of segment.

Male. Length 7.4 mm, width 2.0 mm. Head: width 1.02 mm, vertex .51 mm; pallid, frons with oblique black lines each side, median line white, edged with black; clypeus with a median black line, forked on basal one-third to form a Y. Rostrum, length 3.0 mm, reaching upon fifth ventral segment, pale, apical half brownish black. Antennae: segment I, length 1.87 mm, white, ventral surface black, dorsal aspect with a heavy black line from base to apex, outer lateral aspect with a more slender black line; clothed with fine, recumbent pale pubescence, with just a few short erect bristles; II, 3.5 mm, slender, pale yellowish brown, pallid at base, apex blackish; III, 2.3 mm, black, pallid at base; IV, 1.49 mm, black. Pronotum, length 1.05 mm, width at base 1.8 mm; disk pallid, shaded with fuscous and black; basal edge and lateral margin white, bordered by black, median line white, edged with black; propleura white, a heavy black line from behind lower margin of eye, extending across middle of coxal cleft to near basal margin, a secondary black line from top of coxal cleft extending back parallel to the lower line. Mesoscutum rather broadly exposed, a pale spot each side, like an extension forward from the pallid basal angle of scutellum. Scutellum pallid, disk fuscous to black each side of the white median line, apex more broadly pallid.

Dorsal surface rather sparsely set with short, erect pubescent hairs, more thickly intermixed

with recumbent, silvery sericeous pubescence. Hemelytra pallid, shaded and striped with fuscous and black, claval vein and radial vein for full length, marked by a black line; inner half of corium shaded and spotted with fuscous, central area with pallid spot that extends as an oblique line to inner apical angle; embolium pallid, edged with fuscous within, apex black; cuneus white, apex and inner edge spotted and marked with black. Membrane white, strongly and thickly marked with reticulate and vermicu-



Figs. 262-266. Male claspers. 262, *Phytocoris nigrolineatus*; 263, *P. hesperius* Kngt.; 264, *P. hesperellus*; 265, *P. mellarius* Kngt.; 266, *P. heidemanni* Reut.

late black pattern, more sparsely marked around central area, also a paler spot by apex of cuneus and marginal spot at middle of apical half; cubital vein pale yellowish, vein between areoles black. Ventral surface of thorax pallid, shaded with fuscous and black. Legs white, hind coxae fuscous on base, front and middle femora white, but with dorsal and lateral black lines to match antennal segment I; hind femora with reticulate pattern on dorsal aspect, anterior and posterior aspects with longitudinal black lines; tibiae with longitudinal black line on dorsal aspect, the line interrupted or becoming obsolete on distal one-third, apices black, ventral aspect with two black spots, indicating two incomplete black annuli; tarsi black. Venter pale beneath, sides with dorsolateral black band; basal half of genital segment black; a sharp tubercle above base of left clasper (Fig. 262), claspers distinctive.

Female. Length 5.8 mm, width 2.1 mm, brachypterous. Head: width 1.09 mm, vertex .58 mm. Rostrum, length 3.4 mm, reaching upon base of ovipositor. Antennae: segment I, length 2.07 mm; II, 3.7 mm; III, 2.4 mm; IV, 1.25 mm; color as in the male. Pronotum, length .78 mm, width at base 1.32 mm. Hemelytra brachypterous, cuneus rounded, very short; membrane absent.

Holotype: ♂ June 17, 1965, Area 6M, Nevada Test Site (H. H. Knight & J. M. Merino), taken on *Salazaria mexicana*. **Allotype:** ♀ June 15, 1965, Area 6M, Nevada Test Site (H. H. Knight & J. M. Merino), taken on *Salazaria mexicana*. **Paratypes:** ♂ June 17, 1966, Gerlach, Washoe County, Nevada (W. Gagne). Area TM, ♂ ♀ June 14, 1965; Area 18M, 3♂ July 22, 1965, at incandescent light; Area 12M, 2♂ July 25, 1962, at black light; Area 12CF, ♂ Aug. 9, 1964, at incandescent light, Nevada Test Site.

Phytocoris mellarius Knight

Fig. 265

Phytocoris mellarius Knight, 1925:56.

Described from Arizona; now found at the test site: Area 12M, ♂ 3♀ Aug. 24; 2♀ Aug. 25, 1965, on *Pinus monophylla*; ♀ July 27, ♂ Aug. 9, 1965; ♀ July 25, 1962, at black light; ♂ July 25, 1962; Area 12CE, 2♂ July 24, 1964, on *Pinus monophylla*; Area 12CF, ♂ Aug. 9, 1964, at incandescent light; Area 16M, 4♂ 6♀ June 24, 1965, on *Pinus monophylla*; Area 19M, ♂ June 23, 1965; Area 401M, ♂ 3♀ June 19, 1965; Area ECA, ♂ Aug. 5, 1962, at black light.

Phytocoris pulchellus Knight

Phytocoris pulchellus Knight, 1934:15.

Known from Arizona, where it has been taken on *Quercus oblongifolia*.

Phytocoris miniatus Knight

Phytocoris miniatus Knight, 1961:480.

This species was described from Tucson, Arizona, and is now known from Utah: 2♂ June 30, 1965, St. George (H. H. Knight).

Phytocoris brevisculus Reuter

Phytocoris brevisculus Reuter, 1876:68.

Phytocoris brevisculus Knight, 1927:44.

Phytocoris brevisculus Knight, 1941:184.

This species breeds on "mesquite" but is most commonly taken at lights. It is known from Arizona, Texas, Alabama and rarely northward.

Phytocoris albellus Knight

Phytocoris albellus Knight, 1934:14.

This species was described from Arizona and is now known from California: 2♂ Aug. 22, 1924, Mountain Springs (E. P. Van Duzee).

Phytocoris tinctus Knight

Phytocoris tinctus Knight, 1928:36.

This species is known from Arizona and California.

Phytocoris umbrosus Knight

Phytocoris umbrosus Knight, 1928:37.

This species is known from Arizona, Colorado, and New Mexico.

Phytocoris stellatus Van Duzee

Phytocoris stellatus Van Duzee, 1920:350.

This species was described from Carmel, California. Additional records: ♂ ♀ Aug. 20, Pingree Park; ♂ ♀ Aug. 24, Estes Park; ♂ ♀ Aug. 7, 1925, Trinidad (Stonewall), Colorado (H. H. Knight), taken on *Pinus aristata*.

Phytocoris simulatus Knight

Fig. 268

Phytocoris simulatus Knight, 1928:34.

Known from Colorado and New Mexico, where it breeds on *Pinus edulis*.

Phytocoris politus Reuter

Fig. 269

Phytocoris politus Reuter, 1909:21.

The only specimens of this species that I have seen are co-types from Ormsby County, Nevada (C. F. Baker).

Phytocoris maritimus Van Duzee*Phytocoris maritimus* Van Duzee, 1920:349.

This species was described from Carmel, California, and I have not seen any new material.

Phytocoris jucundus Van Duzee*Phytocoris jucundus* Van Duzee, 1914:17.

Known only from California where Van Duzee found it abundant on pine trees in the Cuyamaca Mts., San Diego County.

Phytocoris decurvatus, new species

Fig. 273

In the key this species runs in the couplet with *breviatus*, but may be distinguished by the longer rostrum and male genital segment without a tubercle above base of left clasper (Fig. 273).

Male. Length 5.5 mm, width 1.7 mm. Head: width 1.02 mm, vertex .30 mm; eyes large, vertex narrow. Rostrum, length 2.6 mm, reaching upon seventh ventral segment, pale yellowish, apex black. Antennae: segment I, length 1.02 mm, white, pallid beneath except at base, dorsal surface with reticulate pattern of brownish black, apex broadly black above, pallid below, spines pallid, others black that arise from black surface; II, 2.4 mm, cylindrical, brownish black, darker on apex and bordering the white annulus at base; III, 1.19 mm, black, white at base; IV, .95 mm, black. Pronotum, length .74 mm, width at base 1.4 mm, fuscous brown, calli paler, basal edge of disk pallid, but irregularly cut and invaded by a sub-basal black band which is wider near middle; propleura fuscous, pale on ventral edge. Mesoscutum moderately exposed, dark fuscous, a pale spot each side. Scutellum pallid, fuscous on median line at base, but leaving a narrow pale median line, the infuscation flaring out beyond middle to connect with stronger black spot each side before apex.

Dorsal surface clothed with suberect pale to fuscous pubescent hairs, intermixed with recumbent and appressed, pale to silvery, sericeous pubescence. Hemelytra fuscous to black, paler along claval commissure, a paler triangle on

apical edge of corium; cuneus dark, pale on outer edge except for three spots. Membrane opaque white, rather evenly and thickly marked with conspurcate, reticulate and vermiculate patterns of fuscous brown, a small clear spot by apex of cuneus. Thorax fuscous beneath. Coxae pallid, femora pallid at base, but for the most part marked with reticulate pattern of fuscous and black; front and middle tibiae with three blackish annuli, leaving pallid bands at base and apex; hind femora with brownish black but broken by small and large pallid spots; tarsi fuscous, but middle segment paler. Venter fuscous, paler beneath; genital segment without tubercles but form of claspers distinctive (Fig. 273).

Holotype: ♂ Aug. 9, 1965, Area 12M, Nevada Test Site (J. M. Merino), at black light.

Phytocoris breviatus, new species

Fig. 274

Runs in the key to the couplet with *decurvatus* from which it may be separated by the shorter rostrum, and male genital segment with a small tubercle above base of left clasper (Fig. 274).

Male. Length 5.6 mm, width 1.7 mm. Head: width 1.08 mm, vertex .34 mm, subequal to dorsal width of an eye; pale yellowish, frons with oblique reddish lines each side of median line, vertex also with reddish lines. Rostrum, length 2.04 mm, just reaching to base of posterior trochanters, pallid, apex brownish black. Antennae: segment I, length 1.05 mm, pallid, a black band on apex, an irregular brownish black band just before middle, and brownish spot above at base, also a few erect pale bristles on dorsal aspect; II, 2.0 mm, fuscous brown, more fuscous near apex, a white annulus at base; III, 1.19 mm, black, white annulus at base; IV, missing. Pronotum, length .88 mm, width at base 1.53 mm; pale yellowish brown, disk infuscated, darker near lateral margins, sub-basal margin with a line of connected fuscous spots, calli more yellowish; propleura pallid, a black line crosses middle of coxal cleft. Mesoscutum yellowish, a fuscous spot each side of median line. Scutellum pale yellowish, a fuscous line or with dots on median line, apical half with fuscous dots or marks each side, wide of the median line.

Dorsal surface with suberect pale to golden simple pubescent hairs, intermixed with recumbent and appressed golden sericeous pubescence. Hemelytra pallid, tinted pale yellowish, marked with dots and fuscous spots, embolium with a series of pallid and fuscous spots; cuneus pale

yellowish, apex and inner basal angle yellowish, disk fuscous but irrorate with several pale dots. Membrane opaque milky white, conspurcate and reticulate with pattern of fuscous brown; spot behind smaller areole more or less connected with a larger pallid area at middle of apical half, and a darker area of fuscous brown behind this; cubitus pale yellowish. Ventral surface of thorax pallid, sternum fuscous but with a pale median line. Legs pallid, femora with fuscous and reddish brown spots, hind femora with reticulate pattern of fuscous on apical half, apical one-fourth darker and irrorate with small pale spots; all tibiae triannulate with fuscous, leaving base and apex yellowish; tarsi yellowish brown. Venter pale to yellowish, with a lateral line of dark spots; genital segment with tubercle above base of left clasper (Fig. 274) and claspers distinctive.

Female. Length 5.8 mm, width 2.0 mm. Rostrum, length 2.2 mm, yellowish, apex brownish black, reaching upon base of posterior trochanters. Antennae: segment I, length 1.1 mm; II, 2.1 mm; III, 1.25 mm; IV, .81 mm, color as in the male. Pronotum, length .92 mm, width at base 1.6 mm. Color and pubescence very similar to the male.

Holotype: ♂ Aug. 26, 1965, Area M (Mercury) Nevada Test Site (J. M. Merino), at laboratory lights. **Allotype:** ♀ Aug. 8, 1965, 17M, Nevada Test Site (J. M. Merino), at black light. **Paratypes:** Area M, ♂ Aug. 8, 3 ♀ Aug. 17, 2 ♀ July 27, 1965, at incandescent light; Area 5M, ♀ July 19, 1965, at black light; Area 16M, ♂ Aug. 19, 1965, on *Atriplex canescens*; Area 18M, 6 ♀ July 22, 1965, at black light; Area CE, ♂ 2 ♀ July 21, 1962, at black light; Area ECH, ♀ Aug. 5, 1962, at black light.

Phytocoris merinoi, new species

Fig. 271

In the key this species runs close to *stitti* Kngt., but size larger, rostrum just reaching upon middle of hind coxae; head white, without marks; male genital segment and claspers distinctive (Fig. 271).

Male. Length 7.5 mm, width 2.7 mm. Head: width 1.15 mm, vertex .37 mm; white, without marks. Rostrum, length 2.5 mm, just reaching to middle of hind coxae, pale yellowish, apex black. Antennae: segment I, length 1.4 mm, dark brown, irrorate with three large and many small pale spots, bristles few, length not exceeding diameter of segment; II, 3.2 mm, cylindrical, yellowish brown, with narrow pale annulus at base;

III, 1.49 mm, yellowish brown; IV, .68 mm, pale yellowish brown. Pronotum, length 1.15 mm, width at base 2.0 mm; pallid to white, disk with basal half more or less filled with fuscous spots but basal angles broadly white, lateral margins with four or five fuscous spots; propleura white, a fuscous line along dorsal margin; collar white, a fuscous spot just opposite top margin of coxal cleft. Mesoscutum moderately exposed, fuscous, a pale spot each side. Scutellum rather strongly convex, pallid, basal half freckled with fuscous, but median line remains clear.

Dorsal surface clothed with rather short, suberect, simple fuscous hairs, and intermixed with recumbent and appressed, pale to silvery, sericeous pubescence. Hemelytra pallid to white, shaded and marked with conspurcate pattern of dots and spots; claval vein mostly pallid, outer apical half of corium paler, with fewer and smaller dusky spots; embolium pallid, marked by a series of fuscous spots; cuneus with reticulate pattern of fuscous, basal angles paler, extreme apex brownish yellow. Membrane opaque white, with conspurcate and reticulate pattern of fuscous brown marks; small area by tip of cuneus and larger area around middle of apical half nearly clear of spots; cubital vein pale to white, areoles with numerous brownish dots and marks. Ventral surface of thorax pallid to white, mesosternum slightly infuscated. Legs pallid to white; femora with reticulate pattern of fuscous brown on apical half, broken and filled with numerous pale irrorations; front and middle tibiae with three fuscous annuli, not counting base and apex which show slight infuscation; hind tibiae with three fuscous areas on basal half, counting a wide and indistinct reticulate area on middle. Venter chiefly pallid but having a broken fuscous brown lateral line, and small dots and spots elsewhere. Genital segment with tubercles and claspers that are distinctive (Fig. 271).

Female. Length 6.8 mm, width 2.5 mm. Head: width 1.12 mm, vertex .47 mm. Rostrum, length 2.7 mm, reaching near apex of hind coxae. Pronotum, length 1.19 mm, width at base 2.17 mm. Very similar to the male in coloration and pubescence.

Holotype: ♂ June 11, 1965, Area 16M, Nevada Test Site (D. E. Beck, II, H. Knight & J. M. Merino), taken on *Grayia spinosa*. **Allotype:** ♀ same data as the type. **Paratypes:** ♂ 5 ♀ taken with the types. Area 6M, 2 ♀ June 15, 1965, taken on *Salazaria mexicana*; Area CM, ♀ June 13, 1965, taken on *Hymenoclea salsolae*; Area MD, 2 ♂ May 16, 1961, at black light, Nevada Test Site.

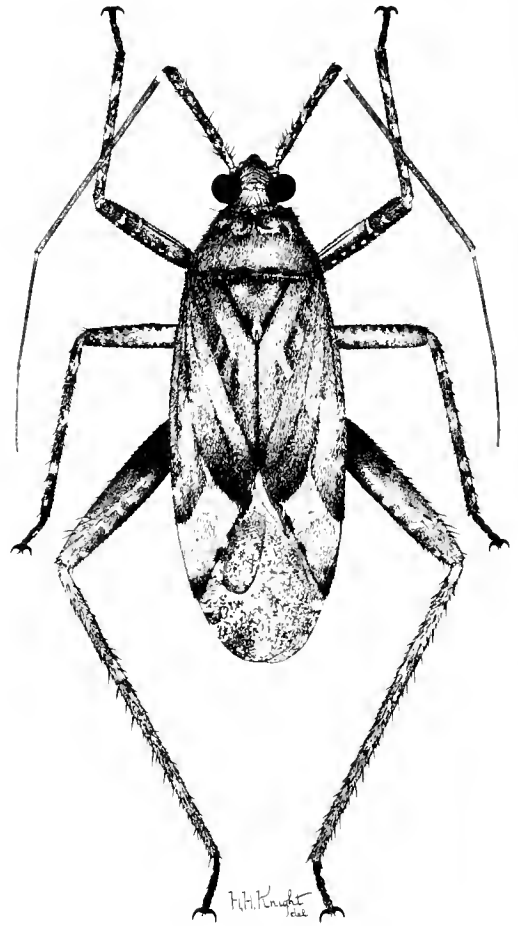
Phytocoris quadriannulipes, new species

Fig. 270

In the key this species runs in the couplet with *plenus* Van D., from which it may be separated by scutellum having a pale median line and apex of antennal segment I not black; male genital segment and claspers distinctive (Fig. 270).

Male. Length 7.6 mm, width 2.2 mm. Head: width 1.12 mm, vertex .37 mm; pale yellowish, frons with striae and vertex with reddish brown lines. Rostrum, length 2.9 mm, reaching upon seventh ventral segment, yellowish, apex dark brown. Antennae: segment I, length 1.39 mm, reddish brown, with a dozen or so pallid glabrous spots, ventral surface pallid, set with golden brown spines; length of spines slightly exceeding diameter of segment; II, 2.7 mm, cylindrical, yellowish brown, with narrow pale annulus at base; III, 1.36 mm, dark brown; IV, .98 mm, fuscous brown. Pronotum, length .90 mm, width at base 1.6 mm; pallid to yellowish brown, basal edge pallid, bordered by an irregular sub-basal fuscous band; disk irregularly marked with fuscous, calli with reddish brown lines; propleura pallid, dorsal margin with brownish line, a wider red brown bar across middle of coxal cleft. Mesoscutum moderately exposed, dusky brown, median line pallid. Scutellum dusky brown, irrorate with paler, narrow median line white.

Dorsal surface clothed with rather short, suberect, simple brownish hairs, intermixed with recumbent and appressed, golden and some silvery sericeous pubescence. Hemelytra pallid to dusky brown, claval vein and apical area of corium darker, embolium pale, marked with a series of dark brown spots; cuneus pale, with a reticulate pattern of dark brown, apex, spot on margin of paracuneus, and tip of embolium brownish black. Membrane opaque white, rather uniformly marked with conspurcate, reticulate, and veniculate patterns of dark brown; small spot by apex of cuneus and marginal area at middle of apical half, nearly clear of spots; cubital vein reddish brown, vein separating areoles, dark fuscous. Thorax dusky brown beneath, spot on epimera paler. Coxae white, hind pair with two brown spots near base; femora marked with reticulate pattern of brown, irrorate with numerous small pale spots, paler on base; tibiae pallid to white, annulate with dark brown, leaving four white annuli, and the apex dark brown. Venter pallid, sides rather densely marked with flakes and dots of reddish brown. Genital segment with tubercles and form of claspers dis-

Fig. 267. *Phytocoris heidmanni*, ♀ type.

tinctive of the species (Fig. 270). The fact that no females were taken with the males at light, suggests that the females may be brachypterous.

Holotype: ♂ July 15, 1929, Richfield, Utah (E. W. Davis), taken at light trap. **Paratypes:** 3♂ same data as the type. 3♂ May 21, 1930, Richfield, Utah (E. W. Davis), taken at light trap.

Phytocoris stitti Knight

Fig. 275

Phytocoris stitti Knight, 1961:474.

This species is known only from Tucson, Arizona.

Phytocoris plenus Van Duzee

Fig. 276

Phytocoris plenus Van Duzee, 1918:282.

This species was described from San Diego County, California. I now recognize specimens from the test site: Area CT, 2♂ 2♀ June 20, 1965, on *Malacothrix*; Area 17M, ♂ Aug. 8,

1965, at black light; Area 18M, 5♂ 16♀ July 22, 1965, at black light; Area 410M, 3♀ July 21, 1965, at black light; Area TM, ♀ June 14, 1965; Area M, ♀ Aug. 25, 1965, at incandescent light; Area CBA8, 2♂ April 25, 1961, taken in a can pit-trap; Area 1BF30, ♀ May 19, 1961, taken in a can pit-trap.

Phytocoris bakeri Reuter

Phytocoris bakeri Reuter, 1909:28.

The type of this species came from Claremont, California (C. F. Baker), and I have seen other specimens from Los Angeles County, California.

Phytocoris piccicola Knight
Fig. 283

Phytocoris piccicola Knight, 1928:32.

This species is known from Arizona and Colorado, where it occurs on spruce, *Picea*.

Phytocoris carnosulus Van Duzee

Phytocoris carnosulus Van Duzee, 1920:347.

This species was described from Prescott, Arizona.

New records: ♂ July 5, 1917, Fort Stockton, Texas (H. H. Knight), taken at light. Area 12M, ♂ July 25, 1962; ♂ Aug. 9, 1965, at black light; Area ECH, ♂ Aug. 5, 1962, at black light, Nevada Test Site.

Phytocoris hesperius Knight
Fig. 263

Phytocoris hesperius Knight, 1928:44.

Known from Arizona, Colorado, New Mexico, Wyoming, and Oregon.

Phytocoris heidemanni Reuter
Figs. 266, 267

Phytocoris heidemanni Reuter, 1909:27.

Described from New Mexico. I have identified specimens from Santa Catalina Mts., Arizona. Also collected on *Pinus ponderosa* in Colorado.

Phytocoris cercocarpi Knight
Fig. 284

Phytocoris cercocarpi Knight, 1928:39.

This species was described from Colorado where it was taken on mountain mahogany, *Cercocarpus parvifolius*.

Phytocoris roscotinctus Knight

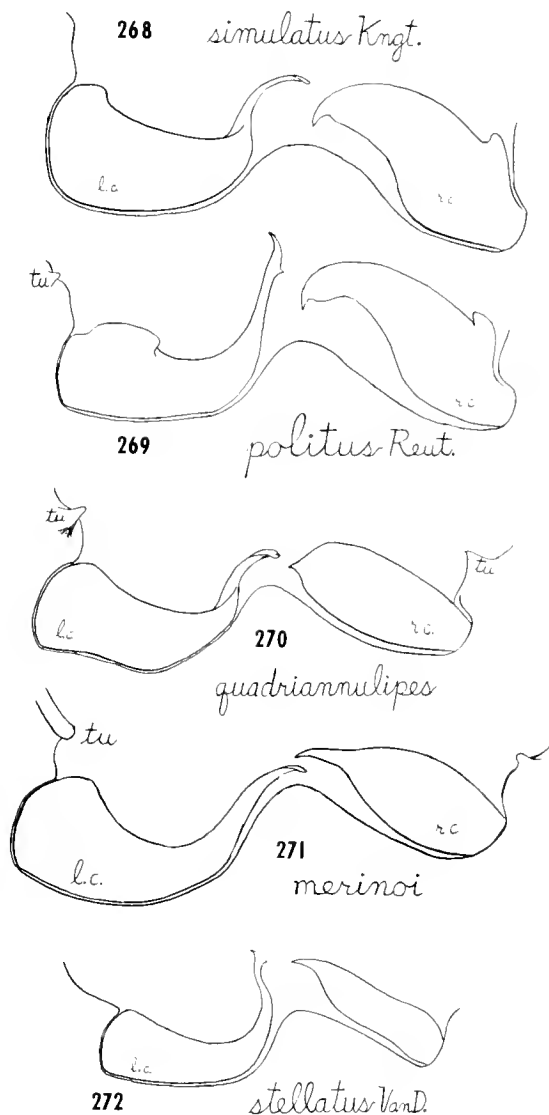
Phytocoris roscotinctus Knight, 1925:52.

This species is known from Arizona and New Mexico.

Phytocoris gracillatus, new species
Fig. 278

Allied to *angusticollis* Kngt., but differs in having antennal segment 1 pallid on ventral aspect; hemelytra pallid, marked with small fuscous dots and reticulations only; male genital segment and claspers distinctive (Fig. 278).

Male. Length 6.0 mm, width 1.7 mm. Head: width .92 mm, vertex .34 mm; pallid, frons with striate black lines that merge to form a black

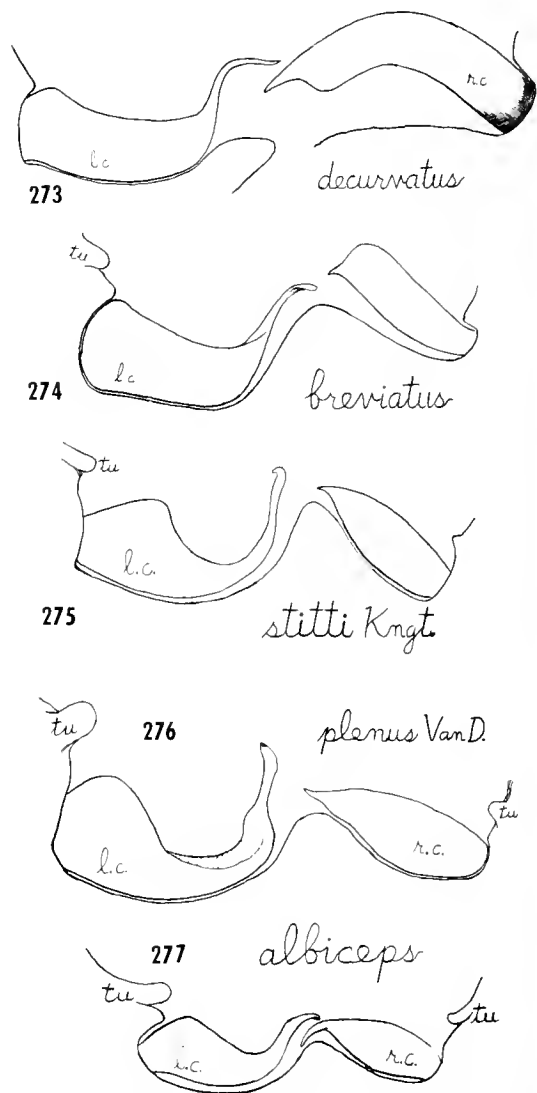


Figs. 268-272. Male claspers. 268, *Phytocoris simulatus* Kngt.; 269, *P. politus* Reut.; 270, *P. quadriannulipes*; 271, *P. merinoi*; 272, *P. stellatus* Van D.

patch each side; clypeus black, a yellowish spot each side on basal half, apex and margins pallid on apical half. Rostrum, length 2.4 mm, reaching upon sixth ventral segment, pallid, apex black. Antennae: segment I, length 1.12 mm, ventral surface pallid except at base, edged by a black line, dorsal aspect black, broken by four white spots, spines suberect, pale to yellowish, length scarcely equal to thickness of segment; II, 2.55 mm, brownish black, with a white annulus at base; III, 1.39 mm, black, narrowly pale at base; IV, .88 mm, black. Pronotum, length .74 mm, width at base 1.36 mm; pale and shaded with fuscous, basal edge of disk white, bordered by a sub-basal black band; calli with dark lines and collar with two black spots above; pleura pallid, with black line bordering dorsal margin, a second but shorter black ray across middle of coxal cleft. Mesoscutum moderately exposed, black, a pale spot each side. Scutellum black, basal angles and median line that widens toward apex, white.

Dorsal surface clothed with simple, suberect black hairs, intermixed with recumbent and appressed, silvery sericeous pubescence. Hemelytra pallid, rather thickly marked with small and large fuscous spots and dots, darker on inner half of corium, a black line forming on radius, paler bordering commissure of clavus; cuneus pallid, thickly marked with spots and reticulate marks, outer edge white. Membrane opaque white, thickly and strongly marked with conspurcate and reticulate patterns of fuscous, apical half with two large patches that break on the edges into reticulate marks and dots; cubital vein pallid, vein separating areoles black. Thorax beneath fuscous black, median line of mesosternum and mark across episternum pallid. Coxae pallid, femora pallid, front pair with two broken longitudinal black lines on posterior aspect; middle femora pallid, with reticulate black pattern on apical half; hind femora black, irrorate with many small and large white spots; tibiae triannulate with black, front pair with apical band widest, middle pair with apex and base pallid; posterior tibiae pallid, with three dark band areas which are broken by white spots; tarsi fuscous. Venter fuscous and black, paler beneath but invaded by dark spots. Genital segment and claspers distinctive (Fig. 278).

Female. Length 5.8 mm, width 1.7 mm. Head: width .92 mm, vertex .44 mm. Rostrum length 2.4 mm, reaching upon fifth ventral segment. Antennae: segment I, length 1.05 mm, white, dorsal aspect with four black spots; II, 2.5 mm; III, 1.4 mm; IV, .85 mm, Pronotum,



Figs. 273-277. Male claspers. 273, *Phytocoris decurvatus*; 274, *P. breviatus*; 275, *P. stitti* Kngt.; 276, *P. plenus* Van D.; 277, *P. albiceps*.

length .85 mm, width at base 1.48 mm. Paler and more broadly white than in the male, but pubescence similar.

Holotype: ♂ June 23, 1965, Area 19M, Nevada Test Site (H. H. Knight & J. M. Merino). **Allotype:** ♀ June 17, 1965, Area 17M, Nevada Test Site (H. H. Knight & J. M. Merino). **Paratypes:** 2♂ July 6, 1930, Richfield, Utah (E. W. Davis). ♂ June 1, 1931; ♂ June 6, 1932, Yakima, Washington (A. R. Rolfs), in light trap.

Phytocoris tricinctipes, new species

Fig. 280

In the key this species runs in the couplet with *gracillatus*, but is very different in size

and robust form; hemelytra shaded and marked by large black areas.

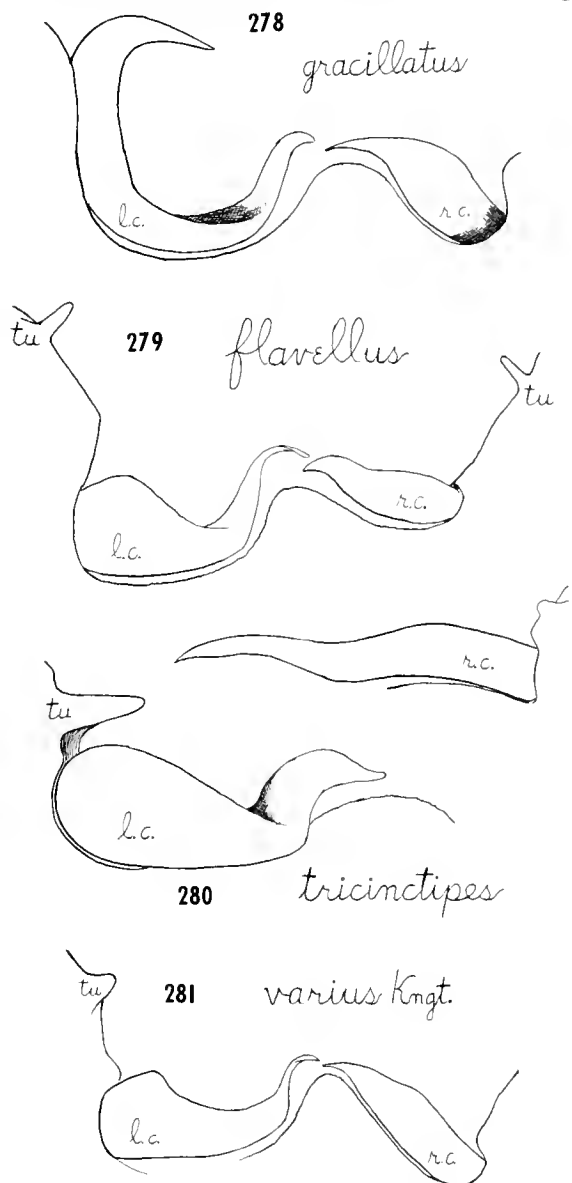
Female. Length 7.2 mm, width 2.4 mm. Head: width 1.22 mm, vertex .44 mm; pallid, frons marked by black striae each side of middle, apical margin black; clypeus with vittate marks on base, a black U-shaped mark across middle. Rostrum, length 3.3 mm, reaching to base of ovipositor, pallid, apex brownish black. Antennae: segment I, length 1.32 mm, pallid beneath, brownish black above, irrorate with three large and several small pale irrorations, also provided with a few erect black bristles which in length

do not exceed diameter of segment; II, 3.0 mm, brownish black, a white annulus at base, apex nearly black; III, 1.53 mm, black, narrowly pale at base; IV, 1.02 mm, black. Pronotum, length 1.12 mm, width at base 1.93 mm; fuscous to black, calli pale but marked with black lines, disk with basal edge white, sub-basal margin black, propleura black, lower margin white. Mesoscutum moderately exposed, pale yellowish, central area and lateral edges blackish. Scutellum blackish, basal angles, apex and narrow median line pallid.

Dorsal surface clothed with suberect, simple black hairs, intermixed with recumbent, in part appressed, silvery sericeous pubescence. Hemelytra pallid, broadly shaded and marked with black, the dark areas more or less irrorate with pale spots; outer half of clavus, inner half of corium, a wide spot at middle and oblique patch joining inner apical angle, blackish but edges cut by irrorate pale spots; embolium with fuscous marks, the apex black; cuneus and paracuneus black, outer basal angle of cuneus white. Membrane opaque white, heavily shaded with fuscous and black, reticulate, conspurcate and vermiculate patterns formed by the dark color, with several medium sized clear areas not invaded by markings, largest clear spot by apex of cuneus; cubital vein pale, vein between areoles blackish, ostiolar peritreme white, blackish on area above. Coxae pallid except for spot on base; femora with strong reticulate pattern of brownish black, paler near base; tibiae with three blackish bands that are broken by pale spots, posterior tibiae more thickly irrorate with pale or white; tarsi fuscous, paler on middle. Venter pallid, with two lateral lines formed by series of spots on segments.

Male. Length 6.6 mm, width 2.2 mm. Head: width 1.15 mm, vertex .34 mm. Rostrum, length 3.2 mm, reaching upon eighth ventral segment. Antennae: segment I, length 1.25 mm; II, 2.8 mm, brownish black, with white annulus at base; III, 1.56 mm, black, pallid at base; IV, 1.02 mm, black. Pronotum, length .95 mm, width at base 1.73 mm. Genital segment and claspers (Fig. 280) distinctive of the species.

Holotype: ♀ July 22, 1965, Area 18M, Nevada Test Site (D E. Beck & J. M. Merino), at incandescent light. **Allotype:** ♂ May 26, 1961, alt. 5400 ft, Mt. Springs Summit, Clark County, Nevada (R. C. Bechtel), taken on *Pinus monophylla*. **Paratypes:** 2 ♀ June 23, 1965, Area 18M Nevada Test Site (H. H. Knight & J. M. Merino), taken on *Pinus monophylla*. ♂ ♀ taken



Figs. 278-281. Male claspers. 278, *Phytocoris gracillatus*; 279, *P. flavellus*; 280, *P. tricinctipes*; 281, *P. varius* Kngt.

with the allotype. ♀ June 8, 1958, Galena Creek, alt. 6200 ft, Washoe County, Nevada (F. D. Parker).

This species is a predaceous type, and I suspect it may feed on some phytophagous species of the pine.

Phytocoris hesperellus, new species

Fig. 264

Runs in the key to the couplet with *hesperius* Kngt., from which it differs in the shorter first antennal segment, which is not equal to width of head plus width of vertex.

Male. Length 6.6 mm, width 1.9 mm. Head: width 1.02 mm, vertex .37 mm; pallid, frons with weak reddish striae, clypeus with reddish brown on middle and sides. Rostrum, length 2.9 mm, reaching upon seventh ventral segment. Antennae: segment I, length 1.32 mm, set with white bristles, the length of which just equal diameter of segment, ventral surface fuscous, above with white near base, marked with reddish brown marks, two large white spots on apical half; II, 2.9 mm, yellowish brown, with white annulus at base, and two pale yellowish spots on dorsal aspect near the white annulus; III, .48 mm, fuscous, yellowish at base; IV, 1.08 mm, fuscous. Pronotum, length .88 mm, width at base 1.76 mm; disk and calli white, basal edge of disk white, lateral margins and more broadly at basal angles blackish, sub-basal margin including four tumid points, black, also with tufts of brownish black scalelike hairs; propleura black, ventral margin white. Mesoscutum narrowly exposed, covered with silvery sericeous pubescence. Scutellum fuscous, basal angles and narrow apex, pallid.

Dorsal surface clothed with pale and fuscous, suberect simple hairs, interspersed with recumbent and appressed, silvery sericeous pubescence. Hemelytra pallid, shaded and marked with fuscous; embolium and outer half of corium, clavus excluding margins of commissure, and cuneus except outer white margin, fuscous. Membrane opaque white, thickly marked with conspurcate, reticulate and vermiculate particles of fuscous, a small unmarked spot by apex of cuneus; cubital vein reddish brown, dividing vein fuscous. Ventral surface of thorax fuscous. Coxae pallid, with a reddish brown spot at base of posterior pair; femora pallid, apical half fuscous, marked by irrorate pale spots; front femora with longitudinal reddish brown line on posterior aspect; front tibiae with three black bands,

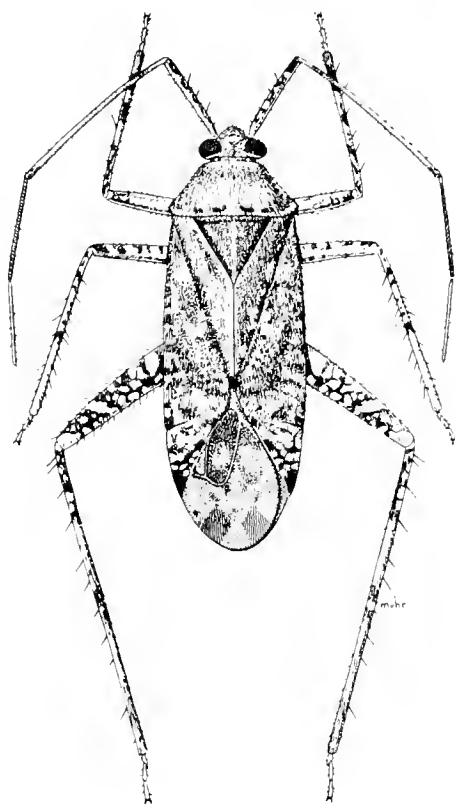


Fig. 282. *Phytocoris salicis* Kngt., ♂.

apical band complete, the other two broken and spotted with white on dorsal aspect, other tibiae not banded, just white and marked with fuscous dots. Venter fuscous; genital claspers distinctive (Fig. 264).

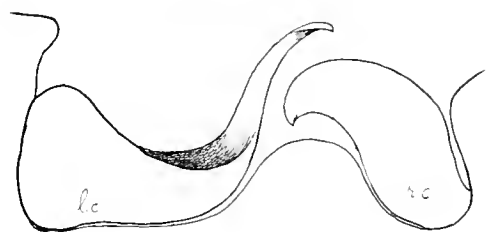
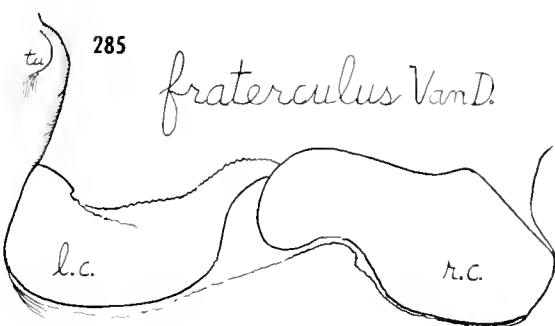
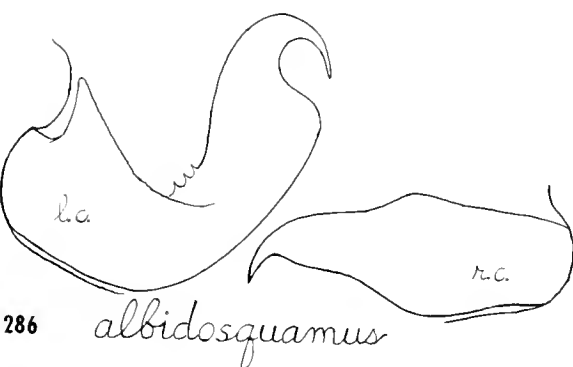
Female. Length 6.4 mm, width 1.9 mm. Head: width .95 mm, vertex .44 mm. Rostrum, length 2.7 mm, reaching upon fifth ventral segment. Antennae: segment I, length 1.42 mm; II, 2.9 mm, yellowish brown, darker on apex and next to the white basal annulus; III, 1.36 mm; IV, .88 mm. Pronotum, length .92 mm, width at base 1.6 mm. Very similar to the male in pubescence and coloration.

Holotype: ♂ July 1, 1955, Salt Lake City, Utah (H. B. Stafford). **Allotype:** ♀ June 16, 1965, Area 17M, Nevada Test Site (H. H. Knight & J. M. Merino).

Phytocoris albidosquamus, new species

Fig. 286

Form of body and pubescence suggestive of *squamosus* Kngt., but antennal segment I much shorter, white, with a black reticulate pattern outlining white spots; segment II black and with a white annulus at base.

283 *piceicola* Kngt.284 *cercocarpi* Kngt.285 *fraterculus* Van D.286 *albidosquamus*

Figs. 283-286. Male claspers. 283, *Phytocoris piceicola* Kngt.; 284, *P. cercocarpi* Kngt.; 285, *P. fraterculus* Van D.; 286, *P. albidosquamus*.

Male. Length 5.3 mm, width 1.5 mm. Head: width .88 mm, vertex .44 mm; white, thickly covered with appressed white scalelike hairs; clypeus with a wide, black median line on basal half, extending above as a black spot on apex of frons. Rostrum, length 2.9 mm, reaching upon seventh ventral segment, pallid, apex black. An-

tennae: segment I, length 1.2 mm, white, dorsal aspect with reticulate black pattern that outlines several white spots, bearing a few erect white bristles which in length do not exceed width of segment; II, 2.9 mm, black, with narrow white annulus at base; III, 1.3 mm, black; IV, .51 mm, black. Pronotum, length .85 mm, width at base 1.36 mm; white, calli outlined in black, a sinuate or waved black line on subbasal margin of disk, propleura uniformly white. Mesonotum moderately exposed, black, thickly covered with white scalelike hairs. Scutellum rather strongly convex, white, blackish on middle at base, the dark color forks at middle of disk and reaches margin well before apex.

Dorsal surface, including the head, thickly and closely covered with appressed, flat, scalelike white hairs, intermixed with suberect, short pale and fuscous simple hairs. Hemelytra white, marked with black lines and spots; claval vein indicated by five or six lineate spots, inner apical angle of corium with edge black, also extending upon paracuneus, radial vein with two black dashes; apex of embolium and tip of cuneus black, inner margin with a tuft of black hairs at middle, on apex and at apex of paracuneus; a sprinkling of small brownish black dots on corium and disk of cuneus. Membrane opaque white, marked with clusters of reticulate, conspurcate and vermiculate fuscous dots and marks; a fuscous arc beginning at apex of smaller areole, curving posteriorly to outer margin, and a spot on margin at middle of apical half, frayed on edges with dots and vermiculate lines; cubital vein white, the vein dividing the areoles, dark. Mesosternum and pleura fuscous to black. Legs pallid, front femora with lines composed of spots, middle femora with reduced spots on apical half; hind femora with larger black spots and marks, the dorsal aspect more white and with reduced fuscous marks; front tibiae with three fuscous bands, the apical band on apex, the bands broken or invaded by white; middle and posterior tibiae white, with black dots but not forming bands; tarsi black. Venter white and marked with black; sides with a narrow longitudinal black line, genital segment black on base. Genital segment without tubercles but claspers distinctive (Fig. 286).

Holotype: ♂ June 14, 1965, Area TM, Nevada Test Site (D E. Beck, H. H. Knight & J. M. Merino). **Paratypes:** ♂ ♀ June 14, 1961, Area 5M, Nevada Test Site, at black light; the female specimen in poor condition—badly rubbed and legs broken—is not suitable for allo-

type description. 3♂ 4♀ June 17, 1966, Gerlach, Washoe County, Nevada (W. Gagne), at light.

Phytocoris flavellus, new species

Fig. 279

Distinguished by the uniformly pale yellowish first antennal segment; median line of pronotum and scutellum white, bordered each side by a pale fuscous line; genital segment with tubercles and claspers distinctive (Fig. 279).

Male. Length 5.7 mm, width 1.87 mm. Head: width .98 mm, vertex .40 mm; pale yellowish, without distinct markings. Rostrum, length 2.4 mm, reaching to sixth ventral segment, pale yellowish, apex brown. Antennae: segment I, length 1.12 mm, slightly thicker on basal third, uniformly pale yellowish, set with a few erect bristles, length about equal to thickness of segment; II, 2.4 mm, cylindrical, uniformly brownish yellow, white annulus at base, clothed with minute, recumbent yellowish pubescence; III, 1.53 mm, brownish yellow; IV, missing. Pronotum, length .85 mm, width at base 1.5 mm; pallid to yellowish, median line white, with white pubescence, bordered each side by fuscous lines; basal edge of disk white, subbasal margin with two tumid spots each side of middle, outlined by pale fuscous; propleura pallid, with the fuscous ray across coxal cleft, extending to posterior margin and across the episternum. Scutellum and mesoscutum with median line white, edged with fuscous.

Dorsal surface clothed with suberect to recumbent, pale yellowish to golden simple pubescence, and intermixed with recumbent and appressed, silvery sericeous pubescence. Hemelytra pallid to pale yellowish, darkest specimens with a bit of pale fuscous on radial vein and inner margin of corium; in darkest specimens with a bit of reddish brown on outer edge of cuneus and tip of embolium. Membrane opaque white, marked with clusters of fuscous conspurcate, reticulate and vermiculate markings; cubital vein pallid. Mesosternum fuscous, episternum crossed with pallid and fuscous rays. Legs pallid to pale yellowish; front femora with a pair of longitudinal brownish lines; hind femora brownish, weakly irrorate with pale spots; tibiae pale yellowish, front pair more brownish on apices; tarsi fuscous brown. Venter pale to yellowish, finely marked with reddish and brown dots; sides with distinct dark brown lateral line. Genital segment distinctive, a rather sharp small tubercle each side on dorsal margin (Fig. 279).

Female. Length 5.1 mm, width 1.8 mm. Head: width .92 mm, vertex .47 mm. Rostrum,

length 2.3 mm, reaching upon fifth ventral segment. Antennae: segment I, length 1.22 mm; II, 2.27 mm; III, 1.6 mm; IV, missing. Pronotum, length .81 mm, width at base 1.5 mm. Very similar to the male in coloration and pubescence.

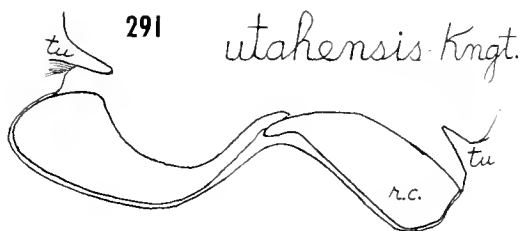
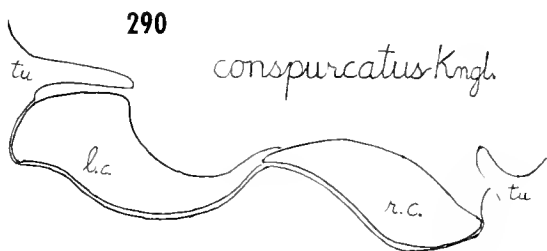
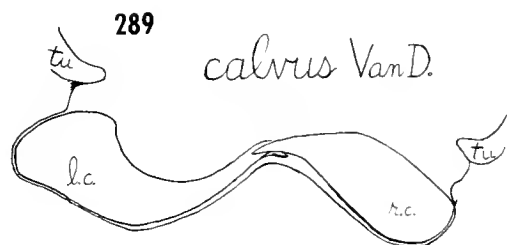
Holotype: ♂ June 11, 1965, Area 16M, Nevada Test Site (D E. Beck, H. H. Knight & J. M. Merino). **Allotype:** ♀ same data as the type. **Paratypes:** ♂ and 2 nymphs taken with the types on *Grayia spinosa*. Area 6M, ♂ June 15, 1965; Area C, 3♂ June 20, 1965, at incandescent light; Area 5M, 2♂ 1♀ July 19, 1965, at black light; Area 410M, 5♂ 2♀ July 21, 1965, at black light; Area 1B, ♂ July 31, 1961, at black light, Nevada Test Site.

Phytocoris albiceps, new species

Fig. 277

Allied to *merinoides*, but separated by the all white head and prothorax which are without infuscations; tibiae without distinct fuscous bands.

Male. Length 7.1 mm, width 2.2 mm. Head: width 1.22 mm, vertex .38 mm; white, without infuscations. Rostrum, length 2.7 mm, reaching to near apex of hind coxae, brownish yellow, apex dark brown. Antennae: segment I, length 1.49 mm; pallid to yellowish white, with brown pubescence near apex grouped in spots but surface color not evident, set with a few pale bristles which in length about equal diameter of segment; II, 3.1 mm, cylindrical, brownish yellow, pallid at base, clothed with minute pallid pubescence; III, 1.6 mm, yellowish brown; IV, missing. Pronotum, length 1.19 mm, width at base 2.07 mm; white, or tinted yellowish, no infuscations. Scutellum and mesonotum white, without infuscations. Dorsal surface clothed with short, suberect, pallid and fuscous simple hairs, intermixed with recumbent and appressed, silvery sericeous pubescence. Hemelytra white, apical area of corium with a few small, pale fuscous dots. Outer edge of cuneus yellowish, inner basal angle with a fuscous point bearing a tuft of dark brown hairs. Membrane and veins opaque white, the whole surface with a scattering few small brown dots. Ventral surface of thorax pale yellowish white, sternum darkened with light brown. Legs pallid to yellowish white; femora with weak indications of darker infuscations; tibiae without fuscous bands; tarsi fuscous brown. Venter yellowish white, sides with a weak fuscous lateral line. Genital segment and claspers distinctive (Fig. 277). Note the sharply hooked, slender tip of right clasper which is dis-



Figs. 287-291. Male claspers. 287, *Phytocoris difformis* Kngt.; 288, *P. lenis* Van D.; 289, *P. calvus* Van D.; 290, *P. conspurcatus* Kngt.; 291, *P. utahensis* Kngt.

tinctive. After making the illustration from the type specimen, and desiring to clean up some debris that comes with trap light specimens, or using a general purpose killing bottle, while using a camels hair brush, it accidentally broke off the more delicate curved tip of the right clasper.

Female. Length 7.0 mm, width 2.3 mm. Head: width 1.12 mm, vertex .47 mm. Rostrum, length 2.7 mm, reaching upon apex of hind coxae. Antennae: segment I, length 1.3 mm; II, 2.7 mm; III, 1.4 mm; IV, .68 mm. Pronotum, length 1.1 mm, width at base 1.87 mm. Very similar to the male in color and pubescence.

Holotype. ♂ May 21, 1938, Barstow, California (J. Standish), taken at light. **Allotype:** ♀ same data as the type. **Paratypes:** 6♂ taken with the type. ♀ April 1, 1941, Yuma (L. L. Stitt), taken on *Franseria dumosa*; ♀ April 10, 1942, Ajo, Arizona (L. L. Stitt).

Phytocoris angusticollis Knight

Phytocoris angusticollis Knight, 1925:57.

This species is known from the Santa Catalina Mts., Arizona.

Phytocoris fraterculus Van Duzee

Fig. 285

Phytocoris fraterculus Van Duzee, 1918:283.

This species is known from northern Arizona, and in California from Yosemite National Park, Nevada County, and San Diego County.

Phytocoris mirus Knight

Phytocoris mirus Knight, 1928:35.

This species was described from Colorado where it was taken on spruce, *Picea*. Also taken from the Santa Catalina Mts. and Huachuca Mts., Arizona.

Phytocoris ingens Van Duzee

Phytocoris ingens Van Duzee, 1920:340.

This large hairy species was taken at Pasadena, California.

Phytocoris validus Reuter

Phytocoris validus Reuter, 1909:31.

This species was described from Colorado where it is fairly common. Other record: ♂ Aug. 24, 1922, at Capa, South Dakota (H. C. Severin).

Phytocoris varius Knight

Fig. 281

Phytocoris varius Knight, 1934:9.

This species is known from Arizona and Colorado; taken on "Cedar Trees," *Juniperus*.

Genus *Phytocoris* Fallen

Key to the Species, Section C

1. Scutellum more strongly convex on posterior half *difformis* Kngt.
 Scutellum normal, not more strongly convex on apical half 2
2. Length of antennal segment I greater than width of head 8
 Length of antennal segment I not exceeding width of head 3
3. Length of antennal segment I subequal to width of head 4
 Length of antennal segment I much less than width of head; vertex very narrow, its width about one-fourth the width of head; length (♂) 4.6 mm
 *brevicornis*, n. sp.
4. Antennal segment I black beneath; width of vertex about equal to one-fourth the width of head; male genital segment without tubercles (Fig. 288); length (♂) 4.1 mm *lenis* Van D.
 Antennal segment I pallid beneath; width of vertex more than one-fourth the width of head 5
5. Hemelytra pallid, with a fuscous line formed along claval vein and on radial vein of the corium; male genital segment with thick, heavy tubercles (Fig. 302); length 3.7-4.1 mm *juniperanus*, n. sp.
 Hemelytra more uniformly fuscous, without definite fuscous lines on clavus and corium 6
6. Rostrum reaching upon base of genital segment; genital segment with tubercle on left side, rather short and somewhat removed from base of left clasper (Fig. 296); length 4.2 mm *chiricaluae*, n. sp.
 Rostrum only reaching to base of seventh or eighth ventral segment 7
7. Width of vertex just equal to one-third the width of head; genital segment with tubercle on left side well removed from base of left clasper (Fig. 299); length 4.7-5.1 mm *relativus*, n. sp.
 Width of vertex greater than one-third the width of head; genital segment with tubercle on left side, longer and resting in contact with the left clasper (Fig. 297); length 4.7 mm *flaviatus*, n. sp.
8. Length of antennal segment I not equal to width of head plus width of vertex 9
 Length of antennal segment I equal to width of head plus width of vertex; length (♂), 5.9 mm *utahensis* Kngt.
9. Frons with fuscous; ventral surface of first antennal segment pallid 10
 Frons white; vertex with a pair of short, longitudinal fuscous lines on middle; ventral surface of first antennal segment blackish, above with several white spots; length (♀), 4.1 mm *albifrons*, n. sp.
10. Cuneus with reddish; hind femora brownish black on apical half, with many small and several large, rounded pallid spots, but not uniting to form definite bands; length 5.8-6.0 mm *calvus* Van D.
 Cuneus not reddish 11

11. Scutellum with fuscous marks and shading 13
Scutellum white, having a small fuscous spot each side just before apex 12
12. Width of vertex not equal to dorsal width of an eye; genital segment distinctive (Fig. 301); length (♂), 5.2 mm *albiscutellatus*, n. sp.
Width of vertex slightly greater than dorsal width of an eye; male genital segment distinctive (Fig. 300); length (♂), 6.0 mm *laticeps*, n. sp.
13. Antennal segment I pallid on ventral aspect 14
Antennal segment I red brown on ventral aspect; rostrum reaching upon eighth ventral segment; length 4.1 mm *minuendus*, n. sp.
14. The black basal half of antennal segment II, without pale spots 16
The brownish black basal half of antennal segment II, with pale spots 15
15. Scutellum and mesonotum infuscated, but median line remains pallid or white; hind femora pallid, apical half with reticulated dark brown, but leaving an oblique white band on both anterior and posterior aspects; male right clasper (Fig. 292) distinctive; length 6.1 mm *calli* Kngt.
Scutellum and mesonotum infuscated, not divided by a pallid median line; hind femora brownish black, having many white spots, but these not joined to form an oblique band; male right clasper (Fig. 303) distinctive; length 6.3 mm *californicus*, n. sp.
16. Width of vertex equal to more than one-third the width of head; male genital segment and claspers distinctive (Fig. 294); size small, length (♂) 4.1 mm *santaritae*, n. sp.
Width of vertex not equal to more than one-third the width of head 17
17. Hind femora with an oblique white band on subapical area of posterior and anterior aspects; male genital segment with a long tubercle on left side that lies close to basal part of left clasper (Fig. 290); length 5.8 mm *conspurcatus* Kngt.
Hind femora without a wide, clear cut oblique white band on subapical area 18
18. Rostrum reaching upon male genital segment; genital segment with a rather short, slightly upturned tubercle above base of left clasper (Fig. 293) *empirensis*, n. sp.
Rostrum just reaching upon seventh ventral segment; male genital segment with a thicker, slightly downturned tubercle that sets more closely to the base of left clasper (Fig. 295). *rinconae*, n. sp.

Phytocoris brevicornis, new species
Fig. 304

Distinguished from allied species by the short first antennal segment which in length is much less than width of head.

Male. Length 4.6 mm, width 1.8 mm. Head: width .95 mm, vertex .27 mm; eyes large and vertex narrow, pale yellowish brown, frons with transverse fuscous striae; clypeus with a geminate mark on base, and transverse mark on

middle, fuscous brown. Rostrum, length 1.76 mm, reaching upon posterior trochanters, yellowish to dark brown on apex. Antennae: segment I, length .64 mm, yellowish brown, dark brown above, leaving three yellowish spots; II, 1.76 mm, dark brown, with white annulus at base and a second one beginning at middle; III, 1.29 mm, dark brown, pallid at base; IV, missing. Pronotum length .85 mm, width at base 1.6 mm, pallid to dusky brown, with sub-basal undulating fuscous line, with two tumid spots each side of

middle; calli and anterior angles of the disk, brownish black; propleura pallid, with a dark brown line along dorsal margin and a short one across top of coxal cleft. Mesoscutum moderately exposed, brownish black. Scutellum rather strongly convex, pale yellowish; across base and rather broadly on median line, and expanding to cover central area of disk, brownish black. Dorsal surface clothed with suberect, fuscous simple hairs, intermixed with recumbent and in part appressed, silvery sericeous pubescence.

Hemelytra dark brownish to fuscous black, pale to pallid along commissure and central area of clavus; apical half of corium with central area pallid; embolium with pale spots along margin; cuneus paler on base, the disk with black spots. Membrane fuscous brown, broken by conspurcate and reticulate pattern of pale spots and larger areas. Mesosternum brownish black, epimera dark brown, ostiolar peritreme pallid. Legs pallid to yellowish and marked with dark brown; coxae pallid, a brown spot at base; femora with reticulate pattern of dark brown and pale spots; front and middle tibiae brownish black, triannulate with pallid white; posterior tibiae with one complete pale band near base, bands on apical half broken and more or less filled with black spots; tarsi dark brown, paler on middle. Venter brownish black, the dark color broken by numerous pale marks. Genital segment and claspers distinctive (Fig. 304).

Female. Length 4.2 mm, width 1.87 mm. Head: width .95 mm, vertex .37 mm. Rostrum, length 1.8 mm, reaching upon posterior trochanters. Antennae: segment I, length .74 mm; II, 1.7 mm; III, 1.09 mm; IV, .68 mm. Pronotum, length .82 mm, width at base 1.56 mm. Very similar to the male in pubescence and coloration.

Holotype: ♂ April 26, 1916, Sabino Canyon, Tucson, Arizona (J. F. Tucker). **Allotype:** ♀ May 18, 1929, Tucson, Arizona (E. D. Ball). **Paratypes:** ♂ ♀ taken with the holotype.

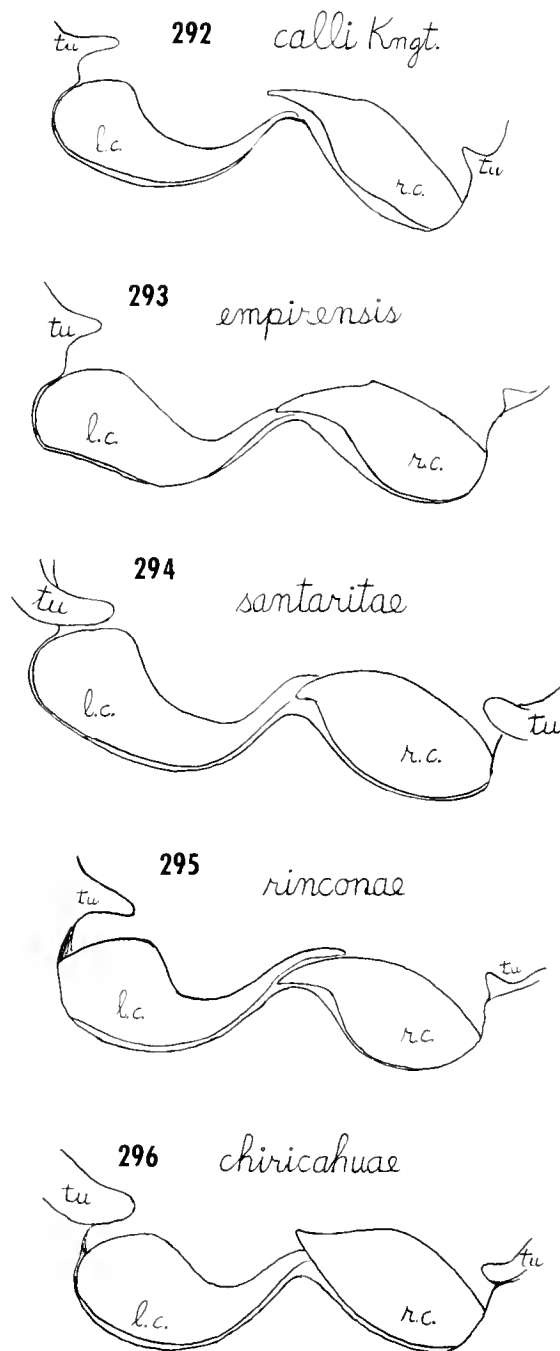
Phytocoris juniperanus, new species

Fig 302

Runs in the key near *chiricahuae* but differs in having a strong fuscous line on claval and radial veins; male genital segment and claspers distinctive (Fig. 302).

Male. Length 4.1 mm, width 1.6 mm. Head: width .85 mm, vertex .34 mm; pallid and marked with fuscous, frons with oblique striae, transversely fuscous across apex; clypeus white, spot on middle and transversely across base reddish

brown; base of juga and dorsal margin of lora, reddish brown. Rostrum, length 2.0 mm, reaching to base of genital segment, pallid, apex dark brown. Antennae: segment I, length .85 mm, just equal to width of head, pallid beneath, white above, apex and a large spot beyond middle black, a small dark spot just short of



Figs. 292-296. Male claspers. 292, *Phytocoris calli* Kngt.; 293, *P. empirensis*; 294, *P. santaritae*; 295, *P. rinconae*; 296, *P. chiricahuae*.

middle, set with several pale spines which in length exceed diameter of segment; II, 1.86 mm, fuscous and brown, a white annulus at base, a pale band at middle but edges not sharply defined; III, .95 mm, fuscous to black, pale at base; IV, .71 mm, fuscous. Pronotum, length .72 mm, width at base 1.36 mm; pallid, calli shaded with fuscous, bristle hairs on disk with minute fuscous dot at base of each; basal edge of disk pallid, with a sub-basal, sinuate black band bordering the pale edge, bent forward at middle to join a narrow fuscous line on middle of disk; propleura white, a fuscous to red ray across top of coxal cleft. Mesoscutum dark fuscous. Scutellum pallid, fuscous on middle at base, with a round fuscous spot each side on margin, at the one-third distance point, measuring from apex back to basal angle of scutellum. Dorsal surface clothed with suberect, simple fuscous hairs, intermixed with recumbent and appressed, silvery sericeous pubescence, also with a scattering of deciduous, black scalelike hairs.

Hemelytra pallid, and shaded with dark fuscous; claval vein and cubitus outlined by fuscous and black lines; inner apical half of corium dark fuscous, bordered by a triangular pallid area that joins the pale paracuneus; euneus pallid, blackish on apex and narrowly along inner edge. Membrane opaque white, thickly marked by conspurcate, reticulate and vermiculate patterns of dark fuscous; veins pallid except the short vein separating the arcoles. Ventral surface of thorax dark fuscous, ostiolar peritreme white. Legs pallid, apical half of femora marked by reticulate pattern of brownish black; front tibiae triannulate with fuscous, apical band more brownish than black; tarsi fuscous, paler on middle. Venter pallid and shaded with fuscous; genital segment more fuscous, each side with a rather thick, prominent tubercle above base of left clasper (Fig. 302).

Holotype: ♂ June 19, 1965, Area 40IM, Nevada Test Site (H. H. Knight & J. M. Merino), taken on *Juniperus osteosperma*. **Paratypes:** 5♂ taken with the type. ♂ July 22, 1965, Area 18M, Nevada Test Site (D. E. Beck & J. M. Merino), taken at black light. ♂ Aug. 3, 1962, Area ECB, Nevada Test Site, taken at black light.

Phytocoris chiricahuac, new species

Fig. 296

Allied to *juniperanus*, rostrum reaching upon base of genital segment; form of tubercles on genital segment and the claspers (Fig. 296), distinctive of the species.

Male. Length 4.2 mm, width 1.53 mm. Head: width .81 mm, vertex .37 mm; pallid, strongly marked with reddish brown; frons with transverse striae, vertex with curving lines, clypeus with geminate mark on base and spot on middle, base of juga and spot on base of lora, reddish brown. Rostrum, length 2.0 mm, reaching upon eighth ventral segment. Antennae: segment I, length .85 mm, pallid beneath, reddish brown above but with four glabrous white spots, set with five or six pallid bristles, which in length slightly exceed diameter of segment; II, 1.9 mm, brownish black, with wide white annulus at base, with pale band on middle but edges not sharply cut; III, 1.05 mm, dark brown, pale on base; IV, .68 mm, fuscous. Pronotum, length .68 mm, width at base 1.25 mm; pallid to dusky, basal edge of disk white, bordered by a single brownish black band or line, tumid spots not developed; calli scarcely outlined, not darker than disk; propleura pallid, dorsal edge brown, a short reddish mark across dorsal edge of coxal cleft. Mesoscutum moderately exposed, fuscous brown. Scutellum pallid, disk marked with small fuscous dots and spots. Dorsal surface clothed with suberect dark brown or fuscous simple hairs, intermixed with recumbent to appressed, silvery sericeous pubescence; also intermixed with deciduous, dark brown or black scalelike hairs, forming tufts at tip of clavus and on apex of paracuneus.

Hemelytra with pallid base, but with numerous dusky to fuscous brown dots and spots, not clear cut; small pale spots and points of silvery sericeous hairs, stand out on corium and clavus; euneus fuscous brown, nearly black on inner edge and apical half of outer edge. Membrane opaque white, but thickly dotted and marked with conspurcate, vermiculate and some reticulate patterns of fuscous brown; a small clear spot by apex of euneus and a second spot on margin at middle of apical half; veins pale to dusky. Ventral surface of thorax fuscous brown, ostiolar peritreme pallid. Venter fuscous brown, more pallid beneath; genital segment with tubercles and claspers distinctive (Fig. 296).

Holotype: ♂ June 20, 1928, alt. 6200 ft, Chiricahua Mts., Arizona (A. A. Nichol). **Paratype:** ♂ taken with the type.

Phytocoris difformis Knight

Fig. 287

Phytocoris difformis Knight, 1934:8.

Known from several localities in Arizona. Once taken on *Acacia greggi*.

Phytocoris lenis Van Duzee
Fig. 288

Phytocoris lenis Van Duzee, 1923:147.

Known from Lower California. Mr. Van Duzee reported taking a pair on "mesquite," *Prosopis*.

Phytocoris calvus Van Duzee
Fig. 289

Phytocoris calvus Van Duzee, 1920:343.

Known from Los Angeles County and San Diego County, California.

Phytocoris utahensis Knight
Fig. 291

Phytocoris utahensis Knight, 1961:473.

Described from Richfield, Utah.

Phytocoris calli Knight
Fig. 292

Phytocoris calli, Knight, 1934:11.

Described from Mt. Timpanogos, Provo, Utah.

Phytocoris conspurcatus Knight
Fig. 290

Phytocoris conspurcatus Knight, 1920:61, Fig. 16.

Phytocoris conspurcatus Knight, 1941:188, Fig. 175.

Known from several eastern states and as far west as Colorado, Kansas, South Dakota, and North Dakota. This is a predaceous species found on the bark of several kinds of trees.

Phytocoris relativus, new species
Fig. 299

Runs in the key to the couplet with *flaviatus* from which it differs in relative width of vertex; width of vertex just equal to one-third the width of head.

Male: Head: width .89 mm, vertex .30 mm; pallid to yellowish, frons with brown striae each side of the dark median line; clypeus with reddish brown V-shaped mark on basal half. Rostrum, length 2.0 mm, reaching upon seventh ventral segment, pale yellowish, apex dark brown. Antennae: segment I, length .88 mm, pallid, dorsal aspect with apex and two reticulate spots of dark brown; II, 2.0 mm, dark brown, with white annulus at base, a somewhat wider pale annulus at middle but edges not sharply defined; III, 1.15 mm, fuscous, pale at base, also

paler at point just beyond middle; IV, .74 mm, fuscous. Pronotum, length .71 mm, width at base 1.4 mm; pale yellowish brown, basal edge of disk white, bordered by sub-basal sinuate band or line, scalloped around the slightly tumid points which bear dark scalelike hairs, disk shaded darker behind calli; propleura dark brown above, with reddish brown ray across top of coxal cleft, ventral half yellowish to white. Mesoscutum moderately exposed, fuscous. Scutellum pale yellowish, median line dark brown, apical half with diverging lines from middle, a fuscous spot each side on lateral margin. Dorsal surface clothed with suberect, dark brown to black simple hairs, intermixed with recumbent and appressed, silvery sericeous pubescence, also intermixed with deciduous, dark brown to black scalelike hairs, with tufts of these hairs on tip of clavus, and inner margin of cuneus and paracuneus.

Hemelytra pale to yellowish, shaded with fuscous and dark brown on outer half of clavus, apical area of corium and spots on embolium; cuneus fuscous to dark brown, area about the fracture and spot on apex of corium pallid. Membrane opaque white, sprinkled with fuscous brown patterns of conspurcate, reticulate and vermiculate marks, with two darker patches behind cuneus and areoles; veins pale yellowish, vein dividing areoles dark fuscous. Ventral surface of thorax dark fuscous brown, ostiolar peritreme pale. Legs yellowish and marked with reddish brown; hind femora dark brown, reticulate with small and large pale spots; front tibiae with three fuscous bands, middle tibiae with four dark bands, posterior tibiae mostly dark and marked with pale and dark spots; tarsi fuscous. Venter dark brown, pallid beneath, with a few small pale spots laterally. Genital segment with tubercles and claspers distinctive (Fig. 299).

Female. Length 5.7 mm, width 1.9 mm. Head: width .92 mm, vertex .37 mm. Rostrum, length 2.4 mm, reaching upon base of ovipositor. Antennae: segment I, length 1.12 mm; II, 2.3 mm; III, 1.36 mm, fuscous, pale at base and at a point slightly beyond middle; IV, .85 mm. Pronotum, length .85 mm; width at base 1.5 mm. Very similar to the male in color and pubescence.

Holotype: ♂ Aug. 2, 1917, at top of Bright Angel Trail, Grand Canyon, Arizona (H. H. Knight). **Allotype:** ♀ Aug. 15, Richfield, Utah (E. W. Davis), taken at light trap. **Paratypes:** ♂ taken with the allotype. ♀ July 19, Texas Pass; ♂ July 24, Oracle (H. H. Knight); 2♂ June 2, 1926, alt. 4500 ft, Tombstone; ♀ May

9, 1926, Salt River Mts., alt. 1300 ft (A. A. Nichol); ♂ April 27, 1939, Yuma County, Arizona (L. L. Stitt).

Phytocoris flaviatus, new species

Fig. 297

Runs in the key to the couplet with *relativus*, but width of vertex greater than one-third the width of head; genital segment with left tubercle and claspers distinctive (Fig. 297).

Male. Length 4.6 mm, width 1.5 mm. Head: width .85 mm, vertex .34 mm; yellowish, frons with oblique, fuscous striae each side of middle, clypeus with a geminate mark at base and spot on middle, fuscous. Rostrum, length 1.93 mm, reaching upon seventh ventral segment, pale yellowish, apex dark brown. Antennae: segment I, length .88 mm, pallid beneath, dorsal aspect fuscous but with three glabrous yellowish spots, set with a few pale spines, which in length are subequal to diameter of segment; II, 2.0 mm, dark brown, with white annulus at base and one of the same width at middle; III, 1.05 mm, fuscous, pale at base; IV, .62 mm, fuscous. Pronotum, length .72 mm, width at base 1.3 mm; pale yellowish, with minute fuscous dot at base of each hair, basal edge white, bordered by sub-basal, undulating black band, including two slightly tumid spots each side of middle; calli yellowish, without dark lines, collar with black spot each side of median line; propleura pallid to yellowish, a short fuscous ray across top of coxal cleft. Scutellum pale yellowish, a fuscous spot each side on margin just before apex. Dorsal surface clothed with suberect, simple fuscous hairs, intermixed with spots of recumbent to appressed, silvery sericeous pubescence, and sprinkled with brownish black scalelike hairs, also with spots and tufts of the same.

Hemelytra pallid to pale yellowish, marked and shaded with fuscous and black; clavus pallid, outer half with dark spots separated by three or four pale spots; corium with large, oblique black spot on apical half, a triangular white spot on apex, small fuscous spots on basal half, embolium with a series of fuscous spots; cuneus fuscous, yellowish on outer basal angle, set with clusters of deciduous hairs on inner margin. Membrane opaque white, thickly sprinkled with conspurcate, reticulate and vermiculate fuscous marks, a paler spot by apex of cuneus; veins pallid, the short vein separating areoles, fuscous. Mesosternum and pleura brownish black, ostiolar peritreme pallid. Legs pallid to yellowish, femora marked with reticulate pattern of brown-

ish black on apical half, hind femora with two oblique paler marks on apical half; fore tibiae with three dark bands, annuli much reduced on middle tibiae; hind tibiae pallid, blackish near base but pallid on dorsal aspect, with one complete black annulus at middle; tarsi pale, slightly dusky on base and apex. Venter dark fuscous brown, pale to yellowish on ventral surface. Genital segment with tubercles and claspers distinctive (Fig. 297).

Holotype: ♂ Sept. 6, 1931, above Bright Angel Trail, Grand Canyon, Arizona (H. H. Knight).

Phytocoris albifrons, new species

Distinguished from allied species by the white frons; collar and calli deep brown, but median line pallid.

Female. Length 4.1 mm, width 1.6 mm. Head: width .88 mm, vertex .34 mm; frons white, a spot on median line, but no indication of striae; vertex with two fuscous lines, one each side of the white median line; clypeus with dark brown across middle. Rostrum, length 1.6 mm, just reaching upon posterior trochanters, yellowish, apex dark brown. Antennae: segment I, length .98 mm, reddish brown beneath, dorsal aspect dark brown, irrorate with about eight glabrous white spots, with several erect white spines which in length are subequal to diameter of segment; II, 1.87 mm, dark yellowish brown, with white annulus at base, a second pale band at middle but edges not clear cut; III, 1.3 mm, fuscous brown, pale at base; IV, .78 mm, fuscous. Pronotum, length .72 mm, width at base 1.36 mm; disk pallid, shaded and marked by fuscous and brown; collar above except median line, and calli deep reddish brown; median line of disk pale, edged by fuscous each side; basal edge white, sub-basal margin of undulating black band or wide line; propleura white, dorsal margin fuscous to black, a brownish black spot or ray across top of coxal cleft. Scutellum white, a fuscous line or streak each side, beginning near basal angle and terminating about two-thirds of distance to apex. Dorsal surface clothed with suberect fuscous hairs, intermixed with recumbent and appressed, silvery sericeous pubescence, also sprinkled with or set in clumps, deciduous, brownish black scalelike pubescence.

Hemelytra pallid, shaded and marked with brownish black; clavus brownish black, somewhat paler behind apex of scutellum, also one or two pale spots along claval vein; corium brownish black, pallid on base, somewhat paler near

middle, and a triangular white spot on apex joining paracuneus; cuneus brownish black, paler on outer basal angle. Membrane opaque white, shaded and marked with conspurcate, reticulate and vermiculate patterns of fuscous and brown; cubital vein pallid around apex of larger areole, and paler area behind apex of

cuneus. Thorax beneath fuscous brown, ostiolar peritreme pallid. Coxae and basal half of femora pallid, apical half of femora marked by reticulate pattern of brownish black; front tibiae with three fuscous annuli, middle tibiae with bands reduced and broken by pale irrorations; tarsi pale, fuscous on base and apex. Venter pallid, sides with spots and marks of reddish brown.

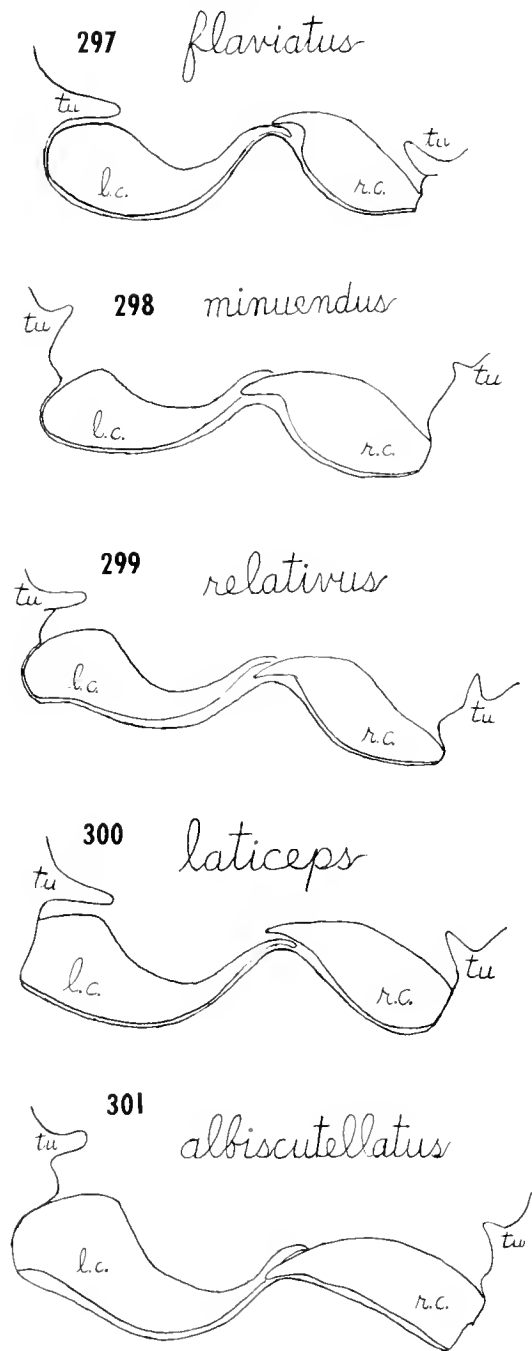
Holotype: ♀ May 24, 1924, Tucson, Arizona (A. A. Nichol).

Phytocoris albiscutellatus, new species

Fig. 301

Runs in the key to the couplet with *laticeps*, from which it may be separated by the narrow vertex; genital segment and claspers (Fig. 301) distinctive of the species.

Male. Length 5.4 mm, width 2.0 mm. Head: width 1.04 mm, vertex .30 mm; vertex not equal to dorsal width of an eye; pallid, frons with transverse striae each side of median line, vertex with median line white; clypeus with dark brown across middle and at base. Rostrum, length 2.5 mm, reaching to near base of genital segment, brownish yellow, apex dark brown. Antennae: segment I, length 1.09 mm, pallid beneath, brown at base, dorsal aspect dark brown, with three or four glabrous white spots, apex brownish black, with several erect pallid spines which in length exceed diameter of segment; II, 2.3 mm, dark yellowish brown, with white annulus at base, also a yellowish annulus at middle but edges not sharply cut; III, 1.36 mm, fuscous brown, pale at base, also a paler yellowish band just beyond middle; IV, 1.02 mm, fuscous. Pronotum, length .95 mm, width at base 1.66 mm; pale yellowish to dusky and shaded with fuscous, basal edge of disk white, sub-basal margin with sinuate band of fuscous which includes three tumid points each side of middle, each point with a tuft of deciduous, scalelike brownish black hairs until rubbed off; calli dusky yellow, with reddish lines on anterior edge; propleura fuscous brown, lower half white. Mesoscutum moderately exposed, fuscous brown, thickly covered with silvery sericeous pubescence. Scutellum rather strongly convex, uniformly white, a small fuscous spot on margin each side well before apex. Dorsal surface clothed with suberect, simple fuscous hairs, intermixed with recumbent and appressed, silvery sericeous pubescence, also intermixed with a sprinkling, and in some spots with tufts of deciduous, brownish black scalelike pubescence.



Figs. 297-301. Male claspers. 297, *Phytocoris flaviatus*; 298, *P. minuendus*; 299, *P. relativus*; 300, *P. laticeps*; 301, *P. albiscutellatus*.

Hemelytra pallid to dusky yellow, shaded and marked with fuscous brown, corium somewhat darker on apical half, but with a pallid dusky triangular area on apex bordering the paracuneus; cuneus fuscous, paler on base, apex and inner margin with black spots and tufts of the deciduous black hairs. Membrane opaque white, rather thickly covered with conspurcate, reticulate and vermiculate patterns of fuscous brown, more sparsely marked on central area and a small clear spot by apex of cuneus. Sternum and pleura brownish black, ostiolar peritreme white. Legs pallid to pale yellowish, femora with reticulate patterns of dark brown, hind femora with numerous small and large pale irrorations. Front tibiae triannulate with brownish black, the third annulus on apex; intermediate tibiae with four dark annuli, counting a narrow terminal band; hind tibiae irregularly marked with brown and white. Venter dark brown, segments three to eight with a row of pallid spots. Genital segments with tubercles and claspers distinctive of the species (Fig. 301).

Female. Length 5.4 mm, width 2.0 mm. Head: width .95 mm, vertex .37 mm. Rostrum, length 2.2 mm, reaching to base of ovipositor. Antennae: segment I, length 1.12 mm; II, 2.3 mm; III, 1.5 mm, fuscous, pale at base and near middle; IV, 1.05 mm. Pronotum, length .86 mm, width at base 1.6 mm. Very similar to the male in color and pubescence.

Holotype: ♂ June 20, 1928, alt. 6200 ft, Chiricahua Mts., Arizona (A. A. Nichol). **Allotype:** ♀ same data as the type. **Paratypes:** ♀ taken with the types. ♀ June 22, 1965, Area 19M, Nevada Test Site (H. H. Knight & J. M. Merino), taken on *Artemisia tridentata*.

Phytocoris laticeps, new species
Fig. 300

Runs in the key to the couplet with *albiscutellatus*, but differs in the wider vertex which exceeds the dorsal width of an eye.

Male. Length 6.0 mm, width 1.6 mm. Head: width 1.05 mm, vertex .40 mm; pallid, frons with transverse striae each side of middle; clypeus with reddish geminate mark on base and spot on middle; base of juga and basal half of lora and bucculae, reddish. Rostrum, length 3.0 mm, reaching upon sixth ventral segment, pale yellowish, apex dark brown. Antennae: segment I, length 1.36 mm, pallid, dorsal aspect with four or five dark brown spots, several glabrous spots give rise to erect pale bristles which in length

slightly exceed diameter of the segment; II, 2.9 mm, dark brown, with white annulus at base, a pale band beginning at middle, the edges not sharply defined; III, 1.7 mm, fuscous brown, pale at base; IV, 1.02 mm, fuscous. Pronotum, length 1.03 mm, width at base 1.7 mm; disk pallid to dusky, basal edge pallid, bordered by a sinuate black band each side of median line, with two tumid, scalloped spots each side, bearing tufts of deciduous black scalelike hairs; calli pallid, but lateral margins of disk dark fuscous to black, the dark color extending down on dorsal margin of propleura as far as top of coxal cleft. Mesoscutum moderately exposed, fuscous. Scutellum pallid, having a small fuscous spot each side on margin well before apex.

Dorsal surface clothed with suberect, dark brown to black simple hairs, intermixed with recumbent and appressed, silvery sericeous pubescence, also intermixed with deciduous, dark brown to black scalelike hairs, the same forming a tuft at tip of clavus. Hemelytra pallid, shaded with fuscous brown to form dark patch on apical area of corium, and smaller patch on middle; clavus spotted and shaded each side of claval vein; embolium with fuscous spots; cuneus brownish black, basal area joining with triangular spot on apex of corium to form a sizeable pale area. Membrane opaque white, marked with fuscous brown in conspurcate, reticulate and vermiculate markings, leaving some clear spaces on apical half, one bordering apex of cuneus. Mesosternum and pleura brownish black, ostiolar peritreme pallid. Venter brownish black, edges of sternites and spots on lateral areas, pallid. Genital segment brownish black, bearing a long tubercle above base of left clasper, also a somewhat smaller tubercle just above base of right clasper; claspers distinctive (Fig. 300).

One may think the claspers and tubercles are very close to those of *utahensis* Kngt., but the key shows other distinctions, such as wider vertex, and differences in length of antennal segments.

Holotype: ♂ Aug. 15, 1929, Richfield, Utah (E. W. Davis), taken at light.

Phytocoris minuendus, new species
Fig. 298

Runs in the key to couplet I3, where it is separated from allied species by the reddish brown first antennal segment.

Male. Length 4.1 mm, width 1.5 mm. Head: width .82 mm, vertex .27 mm; pale and marked

with fuscous, frons with median line and oblique striae fuscous brown, clypeus with geminate mark on base and transverse band across middle reddish brown, base of jugum and mark on basal half of lorum, also reddish brown. Rostrum, length 1.9 mm, reaching upon eighth ventral segment, pallid to brownish yellow, apex dark brown. Antennae: segment I, length .75 mm, ventral surface and dorsal aspect reddish brown, dorsal aspect with four or five white glabrous spots, set with pallid bristles, which in length are subequal to diameter of segment; II, 1.66 mm, yellowish brown, with white annulus at base, also a second pale or yellowish band beginning at middle, edges not sharply defined; III, 1.02 mm, yellowish brown, pale at base; IV, broken. Pronotum, length .74 mm, width at base 1.3 mm; disk pallid, shaded and darkened with fuscous brown, collar with black, median line above with white spot; basal edge white, bordered by a sinuate sub-basal black band, having four tumid points, two each side of median line; propleura white, dorsal margin brownish black, a black ray across top of coxal cleft. Mesoscutum moderately exposed, brownish black. Scutellum brownish black, apex white but a broad black median line divides the white apex, disk with three or four small pale spots each side of the median line. Dorsal surface clothed with suberect dark simple hairs, intermixed with recumbent and appressed, silvery sericeous pubescence, also intermixed with a sprinkling of deciduous, brownish black scale-like hairs; these hairs more abundant on sub-basal margin of pronotum, tip of clavus and inner margin of cuneus.

Hemelytra dark fuscous to brownish black, clavus slightly paler on edge of commissure; corium fuscous brown, slightly paler exterior to radial vein, and a paler triangle bordering paracuneus; cuneus fuscous brown, darker on edges except outer basal angle. Membrane opaque white, rather thickly marked with conspurcate, reticulate and vermiculate patterns of fuscous brown, a paler area by apex of cuneus and area on margin; veins dark brown, paler at apex of areoles. Thorax beneath brownish black, ostiolar peritreme white. Legs pallid, femora marked on apical half with reticulate pattern of reddish brown, the hind femora more nearly solid dark brown with many small white spots; fore tibiae with three dark annuli, middle tibiae with weaker bands; hind tibiae brownish black, a wide pale band just short of middle and a reduced white band at middle of apical half; tarsi pale, dusky on apex. Venter dark brown, ventral area with

rows of pale spots. Genital segment with tubercles and claspers distinctive (Fig. 298); tubercles far removed from base of claspers.

Holotype: ♂ April 20, 1926, Santa Cruz River, Pima County, Arizona (A. A. Nichol).

Phytocoris californicus, new species

Fig. 303

Runs in the key to the couplet with *calli* Kngt., but may be separated by lack of a pale median line on mesonotum and scutellum.

Male. Length 6.4 mm, width 2.2 mm. Head: width 1.05 mm, vertex .30 mm; frons with oblique reddish brown striae each side of median line, lower face marked with reddish brown. Rostrum, length 2.6 mm, reaching upon seventh ventral segment, pale yellowish, apex dark brown. Antennae: segment I, length 1.29 mm, pallid to yellowish beneath, dorsal aspect reddish brown, irrorate with five or six large and several smaller, glabrous white spots, set with several erect white bristles which in length exceed diameter of segment; II, 2.5 mm, dark brown, with white annulus at base, three pallid spots on dorsal aspect of basal half, a pallid annulus just beyond middle, but edges not sharply cut; III, 1.53 mm, dark brown, pale at base, also paler at point beyond middle; IV, 1.02 mm, fuscous. Pronotum, length .94 mm, width at base 1.7 mm; disk pallid to fuscous brown, calli and collar with reddish brown lines, a pale spot on median line of collar; basal edge white, bordered by an undulating fuscous line, with two tumid points each side of middle, dark pubescence mostly rubbed off; propleura deep brown, lower half white. Mesoscutum moderately exposed, dark brown. Scutellum pale to brownish yellow, fuscous but with pale spots, median line dark brown, a pale spot each side of middle on apex. Dorsal surface clothed with suberect, golden brown to black simple hairs, intermixed with recumbent and appressed, silvery sericeous pubescence, also intermixed with a sprinkling and spots of deciduous, golden brown to black scalelike hairs.

Hemelytra pallid to dusky, shaded with fuscous and brown, a darker spot on apical area of corium which is bordered by a triangular paler spot that joins the paracuneus; cuneus somewhat darker fuscous brown, inner edge and apex darker and bearing clusters of the deciduous brown hairs. Membrane opaque white, thickly sprinkled with conspurcate, reticulate and vermiculate dark brown marks; scarcely

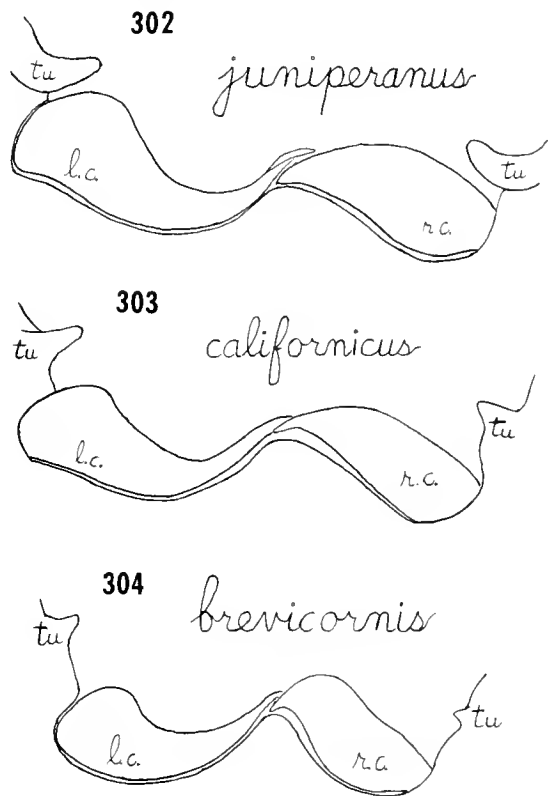
paler or clear of spots just behind cuneus, and the usual area behind that, invaded with spots. Ventral surface of thorax dark brown, ostiolar peritreme pallid. Legs pallid to pale yellowish; femora marked by reticulate patterns of reddish brown, hind femora darker and irrorate with numerous pale spots; tibiae with three brown bands, apex with terminal band; intermediate tibiae with bands much reduced, actually four annuli indicated, with narrow apex brown; hind tibiae with numerous brown spots and dots. Venter dark brown, ventral area with many small pale spots. Genital segment with tubercles and claspers distinctive (Fig. 303).

Holotype: ♂ March 1, 1935, Santa Ana, California (E. L. Paddock), taken on *Salvia mellifera*.

Phytocoris santaritae, new species

Fig. 294

Runs in the key near *empirensis* from which it may be separated by the wide vertex, which in width exceeds one-third the width of head.



Figs. 302-304. Male claspers. 302. *Phytocoris juniperanus*; 303, *P. californicus*; 304, *P. brevicornis*.

Male. Length 4.2 mm, width 1.4 mm. Head: width .78 mm, vertex .34 mm; pallid to dusky brown, frons with oblique striae each side, clypeus with reddish brown on base and middle. Rostrum, length 1.9 mm, reaching upon genital segment, pale to yellowish brown, apex darker. Antennae: segment I, length .88 mm, pale yellowish beneath, dorsal aspect dark reddish brown, with two large and two smaller white glabrous spots, set with a few erect pale spines, which in length about equal diameter of segment; II, 1.57 mm, dark brown, with white annulus at base, a slightly wider yellow band begins at middle, apex more brownish black; III, 1.12 mm, fuscous, pale at base; IV, .78 mm, fuscous. Pronotum, length .71 mm, width at base 1.19 mm; pale to dusky brown, basal edge white, sub-basal margin with undulating black line which curves around the slightly tumid spots, two each side of median line; calli scarcely differentiated by color, but with an impressed line indicating basal margin; propleura white, dark brown along dorsal margin, a reddish ray crosses top of coxal cleft. Mesoscutum moderately exposed, dark brown. Scutellum pale yellowish, spot on median line at base, spot on margin each side before apex, and small spot on apex, brown. Dorsal surface clothed with suberect, fuscous or brown simple hairs, intermixed with recumbent and appressed, silvery sericeous pubescence; also interspersed with deciduous brownish black scalelike hairs, occurring as tufts on black sub-basal line of pronotum, at tip of clavus and along inner edge of cuneus.

Hemelytra pale to dusky brown, somewhat dark brown on embolium, along claval vein, inner apical angle of corium, and cuneus. Membrane opaque white, rather closely marked with conspurcate, reticulate and vermiculate patterns of dusky brown, a small white spot behind apex of cuneus, and marginal spot at middle of apical half; the cubital vein mostly pallid. Ventral surface of thorax brownish black, ostiolar peritreme white. Legs pallid to yellowish brown, femora marked with reticulate pattern of reddish brown, the hind femora more heavily marked with reddish brown, anterior aspect with three or four large pale spots, while the dark areas show small pale irrorations; fore tibiae reddish brown, cut by three white annuli, hind tibiae white but marked and spotted with dark brown. Venter reddish brown to dark brown, ventral sclerites with pale edges and spots. Genital segment with distinctive tubercles and claspers (Fig. 294).

Holotype: ♂ Sept. 26, 1925, Santa Rita Mts., Arizona (A. A. Nichol).

Phytocoris empirensis, new species

Fig. 293

Runs in the key to couplet with *conspurcatus* Kngt., but hind femora without an oblique white band on subapical area; male genital segment with shorter tubercle situated well above base of left clasper (Fig. 293).

Male. Length 4.9 mm, width 1.6 mm. Head: width .95 mm, vertex .32 mm; pallid and marked with reddish brown; frons with oblique reddish brown striae each side of median line; clypeus with geminate mark on base and a brown mark across middle. Rostrum, length 2.1 mm, reaching upon basal half of genital segment, pallid, yellowish brown on apex. Antennae: segment I, length 1.05 mm, pallid beneath, dark brown above, with large white spot on middle and a second one at middle of apical half, two smaller white spots on basal half and other small ones in the dark color of apical half; II, fuscous brown, with white annulus at base and pale band on middle (see female); III, broken. Pronotum, length .82 mm, width at base 1.53 mm; pallid and shaded with fuscous brown, basal half showing minute setigerous dots; basal edge white, bordered by the usual sinuate fuscous band, pubescence rubbed off; propeura white, fuscous brown across dorsal margin, a reddish brown ray across dorsal margin of coxal cleft. Mesoscutum moderately exposed, brownish black. Scutellum pallid, median line solid brown on basal half, splits on apical half to form a pale median line, with an oblique brown ray arising from the margin each side before apex. Dorsal surface clothed with suberect, simple fuscous hairs, intermixed with recumbent and appressed, silvery sericeous pubescence, also interspersed with deciduous, brownish black scalelike hairs which are grouped as tufts on tip of clavus and inner basal edge of euneus.

Hemelytra pallid and shaded with fuscous and dark brown; clavus except commissure margins, and inner third of corium dark fuscous brown, paler areas of corium showing setigerous fuscous spots; embolium pallid, but with a few small fuscous spots; euneus fuscous, outer basal margin and bordering fracture, pallid, paracuneus fuscous. Membrane opaque white, marked with conspurcate, reticulate and vermiculate patterns of fuscous brown, less crowded on apical half; cubital vein pallid. Mesosternum and pleura fuscous, ostiolar peritreme white. Legs pallid, femora marked with spots and reticulate patterns of brownish black on apical half, hind femora irrorate with small pale spots but not

forming an oblique band; tibiae annulate with dark brown and pallid bands, posterior pair more broadly pale, the dark areas broken by pale spots. Venter pallid, shaded and marked with brown on sides. Genital segment with tubercles and claspers distinctive of the species (Fig. 293).

Female. Length 5.2 mm, width 2.0 mm. Head: width .95 mm, vertex .37 mm. Rostrum, length 2.6 mm, reaching upon eighth ventral segment. Antennae: segment I, length 1.25 mm; II, 2.3 mm, fuscous brown, with white annulus at base, a second pale band beginning at middle; III, 1.36 mm, fuscous, pale at base; IV, .85 mm, width at base 1.5 mm. Color and pubescence very similar to the male.

Holotype: ♂ May 20, 1928, alt. 5000 ft, Empire Mts., Arizona (A. A. Nichol). **Allotype:** ♀ same data as the type.

Phytocoris rinconae, new species

Fig. 295

Runs in the couplet with *empirensis* from which it may be separated by the shorter rostrum; male genital segment with tubercles and claspers distinctive (Fig. 295).

Male. Length 5.0 mm, width 1.7 mm. Head: width .95 mm, vertex .30 mm; pale yellowish, frons with oblique fuscous striae each side of median line; clypeus with geminate mark at base and spots on middle. Rostrum, length 2.4 mm, reaching upon seventh ventral segment, yellowish, apex dark brown. Antennae: segment I, length 1.05 mm, ventral surface pallid, dorsal aspect reddish brown, with three large glabrous white spots plus two or three small ones, bearing several erect white bristles which in length slightly exceed thickness of segment; II, 2.1 mm, dark brown, with a white annulus at base and a second pallid band beginning at middle; III, 1.36 mm, fuscous, white at base, pale yellowish on apical half; IV, .92 mm, fuscous. Pronotum, length .81 mm, width at base 1.56 mm; color and pubescence same as for *empirensis*. Dorsal surface clothed with suberect, yellowish to golden brown simple hairs, intermixed with recumbent to appressed, silvery sericeous pubescence, also interspersed with deciduous, golden brown to black scalelike hairs; in perfect specimens these hairs occur in tufts on tumid spots at base of pronotum, tip of clavus and along inner margin of euneus.

Hemelytra pale yellowish, shaded with dusky brown and fuscous; inner half of clavus, inner and outer margins of corium, paracuneus and

cuneus, dark fuscous brown, except outer margin of cuneus near base, the fracture and a triangular spot on apex of corium, pallid. Membrane opaque white, marked with conspurcate, reticulate and vermiculate patterns of fuscous brown, the apical half less crowded with markings, leaving a clear area at apex of cuneus and larger areole; veins pale, except the short vein separating the areoles, fuscous. Propleura and lateral

area of mesosternum dark fuscous, ostiolar peritreme white. Legs pallid, femora marked with remnants of a reticulate pattern; tibiae very similar to that described for *empirensis*. Venter pallid, sides marked with dark brown, reddish marks lower down. Genital segment with tubercles and claspers distinctive (Fig. 295).

Holotype: ♂ May 27, 1928, alt. 3300 ft, Rincon Mts., Arizona (A. A. Nichol).

Genus *Phytocoris* Fallen

Key to the Species, Section CC

- 1. Length of first antennal segment subequal, or greater than, basal width of pronotum 2
 - Length of first antennal segment not equal to basal width of the pronotum 4
- 2. Hemelytra chiefly red; first antennal segment white, spotted and marked with black; length 6.1 mm *roseus* Uhl.
 - Hemelytra chiefly fuscous to black 3
- 3. Hind femora brownish black, marked with numerous small dots or spots only; female brachypterous; length 6.8-8.0 mm *hopi* Kngt.
 - Hind femora black, broken by large white patches which unite to form a long white bar on anterior aspect; length 6.8-7.6 mm *apache* Kngt.
- 4. Hemelytra yellowish green, clavus, inner apical angle of corium, apex and inner margin of cuneus, and veins of membrane, deep dark red; length 5.4-5.8 mm *vau* Van D.
 - Color pattern otherwise 5
- 5. Femora and first antennal segment red, or marked with red 6
 - Femora and first antennal segment not marked with red 8
- 6. Femora and first antennal segment red, marked with pale spots 7
 - Femora pallid to yellowish on basal half; first antennal segment reddish beneath, dorsal surface with large pale to yellowish areas; length 4.1-4.5 mm *acaciae* Kngt.
- 7. Hemelytra uniformly bright red; membrane fuscous, but without two marginal white spots behind cuneus; (♀) length 5.3 mm *vinaceous* Van D.
 - Hemelytra pallid gray, shaded with fuscous along inner margin of corium and on disk of cuneus; embolium and margins of cuneus marked with red; membrane fuscous, filled with small white reticulate spots and marks, having two white marginal spots behind tip of cuneus; length 4.5-4.7 mm *nicholi* Kngt.
- 8. Antennal segment I pallid on ventral surface 9
 - Antennal segment I fuscous to black on ventral surface 12

9. Antennae pallid to pale yellowish brown, segment I with weak brownish spots; segment II yellowish brown, pale band at base and more broadly pale on middle; hemelytra pallid, a fuscous line on radius, and along inner margin of corium on apical half; length 4.6 mm (refer to Sec. B.) *flavellus*, n. sp.
Color pattern otherwise 10
10. Rostrum just reaching upon hind coxae; embolium with five strong fuscous spots; corium and hind femora with fine fuscous dots only; (♀) paratype, length 4.4 mm *loretoensis* Van D.
Rostrum reaching beyond posterior coxae 11
11. Length of antennal segment I subequal, or slightly greater than basal width of pronotum; (♀) paratype, length 5.4 mm *histriculus* Van D.
Length of antennal segment I not equal to basal width of pronotum; clypeus white on basal half, with geminate black lines at base; genital segment with a large vertical tubercle well above base of left clasper (Fig. 305); (♂) paratype, length 6.1 mm *sonorensis* Van D.
12. Antennal segment II with dark color on basal half broken by a spot or two on dorsal aspect 18
Antennal segment II with dark color on basal half not broken by spots or spots on dorsal aspect 13
13. Cubitus and claval vein both indicated by fuscous lines 14
Cubitus and claval veins not indicated by fuscous lines; clypeus white on basal half, but with a complete V-shaped line across base; male genital segment without a tubercle above base of left clasper (Fig. 306); (♂) paratype, length 7.6 mm *commissuralis* Van D.
14. Pronotal disk with a median line, edged each side by fuscous border; length 4.8 mm *strigosus* Kngt.
Pronotal disk without definite median white line 15
15. Length of antennal segment I not equal to width of pronotum; or (♀) over 5.5 mm in length 16
Length of antennal segment I slightly greater than width of pronotum at base; (♀) length 4.8 mm *lineatellus*, n. sp.
16. Antennal segment II black, with clear cut white annulus at base and at middle; length 6.2 mm *deserticola*, n. sp.
Antennal segment II brownish black, with a wide pale band at middle but edges diffuse, not sharply defined 17
17. Dorsal surface of antennal segment I with black reticulate pattern, leaving two prominent white spots on apical half; male genital segment without tubercle above base of left clasper (Fig. 308); length 5.8 mm *yuma* Kngt.
Dorsal surface of antennal segment I white, having one strong black check mark at middle of apical half, and with black lines at middle; male genital segment distinctive (Fig. 307), with a definite tubercle above base of left clasper; length 5.6 mm *minituberculatus*, n. sp.

- 18(12). Antennal segment II black, the white band on middle with edges sharply defined 19
- Antennal segment II brownish, broadly pale on middle, edges not sharply defined 21
19. Rostrum reaching upon eighth ventral segment; hind femora dark fuscous to black, especially on dorsal half, broken only by a few small dots and spots; length (♀) 4.0 mm, (♂) 5.1 mm *rostratus*, n. sp.
- Rostrum not reaching to eighth ventral segment; hind femora white on dorsal half, blackish only on apical fourth; or, median line of anterior aspect with black line, also with oblique lines on ventral half 20
20. Length of antennal segment I subequal, or slightly greater than width of head; hind femora white, with black on apical one-third; length (♂) 4.1 mm, (♀) 4.5 mm *albidopictus* Kngt.
- Length of antennal segment I much greater than width of head; hind femora white, a longitudinal black line on median line of anterior aspect, also joined by other lines on ventral half; length (♂) 4.4 mm, (♀) 4.7 mm *pulchricollis* Van D.
21. Length of antennal segment I greater than width of head plus dorsal width of an eye; length (♂) 6.1 mm *subcinctus*, n. sp.
- Length of antennal segment I not equal to width of head plus dorsal width of an eye; length (♂) 5.1 mm *sublincatus*, n. sp.

Phytocoris roseus (Uhler)

Phytocoris vinaceus Van Duzee

Compsocerochoris roseus Uhler, 1894:253.
Phytocoris roseus Reuter, 1909:27.
Known from San Diego County, California.

Phytocoris vinaceus Van Duzee, 1917:263.
Known from California where it breeds on Manzanita.

Phytocoris hopi Knight

Phytocoris nicholi Knight

Phytocoris hopi Knight, 1928:42.
Known from Arizona, Colorado, and New Mexico.

Phytocoris nicholi Knight, 1928:29.
Known only from Arizona.

Phytocoris apache Knight

Phytocoris loretoensis Van Duzee

Phytocoris apache Knight, 1928:41.
Known from Arizona and New Mexico.

Phytocoris loretoensis Van Duzee, 1923:149.
Described from Lower California where it was collected by Van Duzee on *Lycium richi*.

Phytocoris cau Van Duzee

Phytocoris histriculus Van Duzee

Phytocoris cau Van Duzee, 1912:478.
Known from San Diego County, California, where it was found on the host plant, *Adenostoma fasciculatum*, by Timberlake.

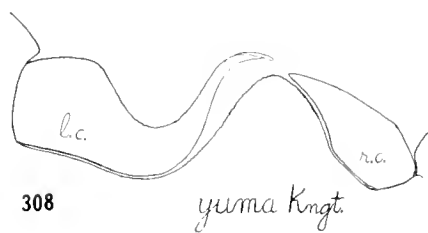
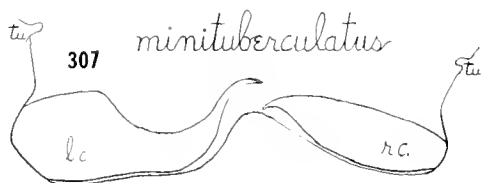
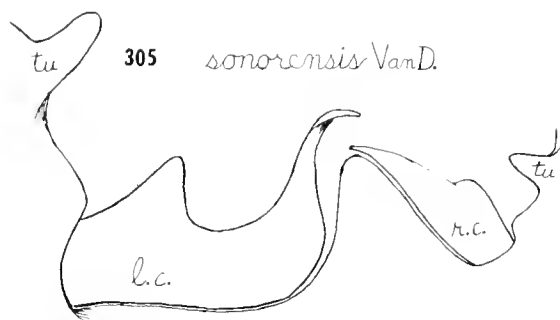
Phytocoris histriculus Van Duzee, 1920:346.
Known from San Diego County, California.

Phytocoris acaciae Knight

Phytocoris sonorensis Van Duzee
Fig. 305

Phytocoris acaciae Knight, 1925:53.
Known from Arizona, New Mexico, and Texas; found to be breeding on *Acacia greggi*.

Phytocoris sonorensis Van Duzee, 1920:342.
Described from San Diego County, California.



Figs. 305-308. Male claspers. 305, *Phytocoris sonorensis* Van D.; 306, *P. commissuralis* Van D.; 307, *P. minituberculatus*; 308, *P. yuma* Kngt.

Phytocoris commissuralis Van Duzee
Fig. 306

Phytocoris commissuralis Van Duzee, 1920:251.
Known from southern California.

Phytocoris strigosus Knight

Phytocoris strigosus Knight, 1925:51.
Known from Arizona and New Mexico.

Phytocoris yuma Knight
Fig. 308

Phytocoris yuma Knight, 1961:479.
Known from Yuma County, Arizona.

Phytocoris albidopictus Knight

Phytocoris albidopictus Knight, 1961:476.

Known from Arizona, California, Nevada, and New Mexico. One male specimen was taken at the test site, Area TM, June 14, 1965 (D. E. Beck, H. H. Knight & J. M. Merino).

Phytocoris lineatellus, new species
Fig. 309

Allied to *deserticola* but second antennal segment longer, length slightly greater than width of pronotum at base; size much smaller.

Male. Length 4.7 mm, width 1.7 mm. Head: width .92 mm, vertex .44 mm, pallid, frons with oblique black striae each side of median line; basal half of clypeus with black V-shaped mark, apical half with slender median line; dorsal margin of jugum and of lorum, black. Rostrum, length 2.4 mm, reaching to base of genital segment, pallid to dark brown on apical segment. Antennae: segment I, length 1.32 mm, black beneath, dorsal surface with three or four large, irregular, white spots, also with a few smaller white dots on sides, set with several erect pale bristles which in length are about subequal to thickness of segment; II, 2.3 mm, brownish black, with white band at base, also with yellowish white band on middle but with indefinite edges; III, 1.6 mm, fuscous brown, pale at base; IV, broken. Pronotum, length .82 mm, width at base 1.53 mm; pallid, basal edge white, marked with an undulating, sub-basal black line which continues around basal angles and along lateral margins; calli black, the dark color extending posteriorly upon disk; collar white but with black each side of median line; propleura white, a black ray across middle of coxal cleft, also a second black line above and parallel with the first. Scutellum pallid, a broad black mark each side of middle and flaring to include lateral margins. Dorsal surface clothed with suberect, simple pale and fuscous hairs, intermixed with recumbent and appressed, silvery sericeous pubescence.

Hemelytra white and marked with black lines and shaded dark areas; claval vein and interrupted parallel line, black; corium with inner half and apical area chiefly black, pallid on middle, radial vein with black; paracuneus and inner half of cuneus black. Membrane and veins opaque white with the larger areole, and two curving bands of black reticulate and conspurcate markings. Mesosternum and band across middle of pleura, brownish black. Legs white

and marked with black; hind femora very broad and long (length 3.4 mm), anterior aspect thickly marked with reticulate bands of black and oblique streaks of white; fore tibiae black, broken by three white annuli, the third white annulus at middle of apical half; posterior tibiae chiefly white, but marked by spots and two incomplete black bands. Venter chiefly black but with white lines and spots beneath and on sides. Genital segment and claspers distinctive, without tubercles (Fig. 309).

Female. Length 4.9 mm, width 1.7 mm; membrane rather short but not brachypterous. Head: width .95 mm, vertex .54 mm. Rostrum, length 2.6 mm, reaching to base of ovipositor. Antennae: segment I, length 1.49 mm; II, 2.6 mm, black, with white band at base and middle; III, 1.5 mm, black, white at base; IV, broken. Pronotum, length .78 mm, width at base 1.3 mm. Very similar to the male in coloration and pubescence.

Holotype: ♂ June 6, 1961, Area JAA9, Nevada Test Site, taken in a can pit-trap. **Allotype:** ♀ May 22, 1961, Area 5EA7, Nevada Test Site, taken in a can pit-trap. **Paratype:** ♀ June 6, 1961, Area JAL10, Nevada Test Site, in a can pit-trap.

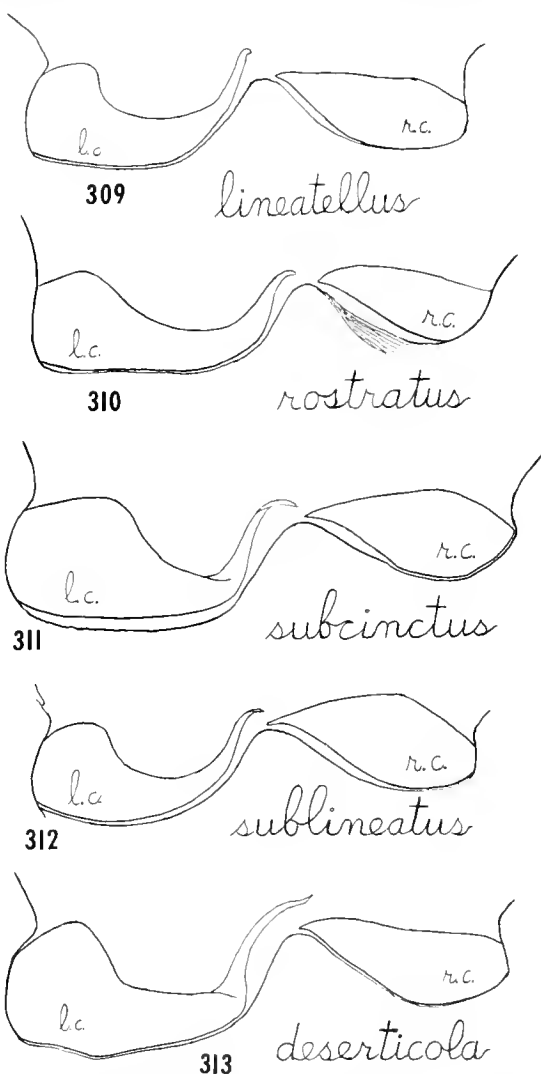
Phytocoris deserticola, new species

Fig. 313

Allied to *lineatellus*, color markings very similar, but second antennal segment shorter, length not equal to width of pronotum at base; segment II black, with a clear cut white annulus at base and one at middle.

Male. Length 6.1 mm, width 2.0 mm. Head: width 1.02 mm, vertex .52 mm; pallid or white, frons with oblique black striae each side of the white median line, shaded brown between the striae; vertex with small arcuate line each side of middle, also with a transverse black line on base just before collar; clypeus brownish black on middle and geminate mark on base; juga and lora with black line on dorsal margin. Rostrum, length 2.8 mm, reaching upon fourth or fifth ventral segment, pallid, blackish on apex. Antennae: segment I, length 1.46 mm, black, unspotted beneath, dorsal aspect with several large and small glabrous white spots, apex black, bearing a few erect white spines which in length are subequal to diameter of segment; II, 2.65 mm, black, with white annulus at base, also a pale annulus beginning at middle; III, 1.93 mm, black, with white annulus at base; IV, missing.

Pronotum, length 1.02 mm, width at base 1.73 mm; white, basal submargin with black line, making two scallops each side of middle, basal angles more broadly black; disk chiefly white, shaded black near lateral margins, over the calli and spot on collar each side of median line; propleura with broad black line across middle of coxal cleft and extending to basal margin, a second parallel black line across top of coxal cleft, but not so wide on posterior half. Mesoscutum moderately exposed, black, a white spot each side that carries over on basal angles of scutellum. Scutellum white, black on middle each side of median line, also with a longitudinal black ray parallel to median line, slightly wider on apical half. Dorsal surface clothed with suberect, simple black hairs, intermixed with re-



Figs. 309-313. Male claspers. 309, *Phytocoris lineatellus*; 310, *P. rostratus*; 311, *P. subcinctus*; 312, *P. sublineatus*; 313, *P. deserticola*.

cumbent and some appressed, sericeous white pubescence.

Hemelytra white, shaded and marked with black; embolium with black spots; claval vein and radial vein outlined with black, a rather broad black band on corium bordering clavus, covering paracuneus and along inner margin of cuneus; outer half of cuneus white, marked with small black spots, the apex black. Membrane and veins white, small vein that separates areoles, black; marked by brownish black patterns of reticulate, conspurcate and vermiculate marks, a stronger arcuate dark mark behind larger areole, but outer edges breaking into patches of reticulate pattern; a white spot behind apex of cuneus, and a second one on margin at middle of apical half. Mesosternum black, a white band on sides that crosses lower edge of episternum, across the pleura and joining with the white ostiolar peritreme. Legs white, the femora with reticulate black areas, front femora with longitudinal black line on posterior aspect; middle femora more white on basal half; hind femora largely black, but irrorate with small and large white spots, anterior aspect with some larger white spots joined in an oblique direction; front tibiae white, with four blackish bands, one on base and fourth band on apex; middle tibiae with black bands reduced in width; posterior tibiae nearly white, a narrow black band at base, one at middle, the third band slightly wider and nearer base than middle; tarsi fuscous to black. Venter chiefly brownish black, ventral surface mostly pallid, sides with white lines and spots; genital segment nearly black, without tubercles but claspers distinctive (Fig. 313).

Female. Length 5.6 mm, width 2.1 mm; moderately arcuate; membrane abbreviated, just covering apex of venter. Head: width 1.02 mm, vertex .54 mm; Antennae: segment I, length 1.63 mm, slightly exceeding width of pronotum, but the large size will separate it from females of *lineatellus*; II, 3.0 mm; III, 2.1 mm; color and bands like the male. Pronotum, length .85 mm, width at base 1.5 mm. More robust than the male but very similar in coloration and pubescence.

Holotype: ♂ June 20, 1965, Area CT, Nevada Test Site (H. H. Knight & J. M. Merino). **Allotype:** ♀ June 13, 1965, Area CM, Nevada Test Site (D. E. Beck, H. H. Knight & J. M. Merino). **Paratypes:** 2♂ taken with the type. ♀ taken with the allotype. ♀ June 22, 1965, Area 401M, Nevada Test Site (H. H. Knight & J. M. Merino).

Phytocoris minutuberculatus, new species

Fig. 307

Runs in the key to the couplet with *yuma* Kngt., from which it may be separated by marks on antennal segment I; male genital segment with a small tubercle above base of left clasper (Fig. 307).

Male. Length 5.5 mm, width 1.9 mm. Head: width .95 mm, vertex .47 mm; pale yellowish, frons with black striae that merge to form a black patch each side of middle, median line and spot each side of apex, yellow, black bordering base of clypeus; base of clypeus with geminate black wedges, and band across middle, black. Rostrum, length 2.5 mm, reaching upon fifth ventral segment, pale yellowish, apical half dark brown. Antennae: segment I, length 1.22 mm, black beneath, white above, the black color extends upward like a reticulate network to cut the white into spots, leaving four or five large white spots above; II, 2.5 mm, fuscous brown, a white annulus at base, a pale annulus at middle but without sharp edges, the apex more brownish black; III, 1.63 mm, brownish black, a white annulus at base; IV, missing. Pronotum, length .85 mm, width at base 1.49 mm; basal edge of disk white, bordered by scalloped black band that extends around basal angles and along lateral margins to join up with brownish black covering the calli; central area of disk pallid to white; propleura white, a black band across middle of coxal cleft, and a parallel black band just above, both slightly undulating but reaching to basal margin. Mesoscutum broadly exposed, pallid and fuscous, median line pale, extending upon scutellum where it is outlined by a fuscous line each side. Scutellum pallid to yellowish, each side with fuscous spot on margin, but not connected with fuscous lines that frame the pale median line. Dorsal surface provided with suberect, pallid and fuscous simple hairs, intermixed with recumbent, silvery sericeous pubescence.

Hemelytra pallid to white, marked and shaded with fuscous and black, inner half of corium mostly black, thinning into spots on inner apical angles, but continuing as a black band across paracuneus and inner half of cuneus; radial vein outlined by black, claval vein with fuscous line broken into short sections; cuneus with outer edge white except on apex. Membrane and veins opaque white, central area, within larger areole, and two spots reaching lateral margin on apical half, marked with reticulate, conspurcate and vermiculate patterns of brownish black; also with a solid arc of dark

color beginning behind apex of larger areole, and curving outward to apical margin where it merges with a patch of reticulate marks. Mesosternum and pleura brownish black, ostiolar peritreme pallid. Legs pallid and marked with reticulate patterns of brownish black; front legs missing, middle femora with reticulate dark pattern on apical half, tibiae with apex and remnants of two bands dark fuscous; hind femora rather wide, having a strong reticulate pattern of brownish black, anterior aspect with reticulate patterns forming obscure oblique bands of dark lines; posterior tibiae chiefly white, but remnants of two black annuli may be recognized. Venter brownish black, ventral area paler, having streaks and spots of pallid color. Genital segment with two small tubercles, one each side, high above base of clasper (Fig. 307).

Holotype: ♂ June 14, 1961, Area 5M, Nevada Test Site, taken at black light.

Phytocoris rostratus, new species

Fig. 310

Runs in the key to couplet 18, where it is separated from related species by the clear cut banding of second antennal segment.

Male. Length 4.9 mm, width 1.5 mm. Head: width .84 mm, vertex .44 mm; pallid and marked with black, median line of vertex white, extending forward upon frons, ending in two spots between the transverse striae, the striae obscured by black shading; clypeus white, brownish black across middle, with geminate black marks on base. Rostrum, length 2.4 mm, reaching upon eighth ventral segment, pallid, apical segment black. Antennae: segment I, length 1.09 mm, black, dorsal aspect with eight white spots, and three or four smaller dots, set with a few white bristles; II, 2.07 mm, cylindrical, black, with white annulus at base, a second white band on middle, the black on basal half, with two elongate white spots on dorsal aspect; III, 1.4 mm, black, white on base; IV, .92 mm, black. Pronotum, length .72 mm, width at base 1.26 mm; fuscous to black, basal edge white, central area of disk pallid to dusky, median line white between calli, and extending upon collar; propleura white, a black band across middle of coxal cleft, becomes wider as it reaches posterior margin, a second black band above and parallel to the first band. Mesoscutum moderately exposed, black, with a white spot each side joining the white basal angles of scutellum. Scutellum black, basal angles and elongate spots

each side of apex, white; in paler specimens the median line white and bordered by fuscous line. Dorsal surface clothed with suberect fuscous and pallid simple hairs, intermixed with recumbent and appressed, silvery sericeous pubescence.

Hemelytra shaded with fuscous and black, with white spots on embolium, paler on middle of corium and more or less pallid on inner half of clavus; cuneus nearly black on apical half and inner margin, outer basal margin white. Membrane largely brownish black, conspurcate and somewhat reticulate with opaque white spots and marks, a spot behind apex of cuneus and smaller marginal spot at middle of apical half, opaque white. Mesosternum and pleura mostly black, a white band across lower half of episternum and extending to join the pallid ostiolar peritreme. Legs pallid and marked with fuscous and black; front femora with dorsal line, and longitudinal line on middle of posterior aspect, black, the lines broken by small white spots; hind femora largely black, irrorate with numerous small white spots; fore tibiae black, broken by three white bands, the third band occupying middle of apical half; hind tibiae white and marked with numerous black spots, more black on basal third, broken on dorsal aspect by white spots; tarsi fuscous to black. Venter mostly black, pallid beneath, sides with white lines and spots. Genital segment without tubercles, and claspers distinctive (Fig. 310).

Female. Length 3.7 mm, width 1.6 mm; embolar margins moderately arcuate, membrane much reduced, just covering apex of venter. Head: width .88 mm, vertex .47 mm. Rostrum, length 2.5 mm, reaching upon middle of ovipositor. Antennae: segment I, length 1.36 mm; II, 2.48 mm, black, with white band on base and slightly wider band on middle, the black on basal half with two elongate white spots on dorsal aspect; III, 1.7 mm, black, white on base; IV, .88 mm. Pronotum, length .64 mm, width at base 1.19 mm. Hemelytra shorter, more arcuate, but color and pubescence very similar to the male.

Holotype: ♂ July 22, 1965, Area 18M, Nevada Test Site (D E. Beck & J. M. Merino), taken at black light. **Allotype:** ♀ June 18, 1965, Area 401M, Nevada Test Site (H. H. Knight & J. M. Merino), swept from *Chrysothamnus nauscosus*. **Paratypes:** ♀ taken with the allotype. ♀ June 14, 1965, Area TM; ♂ June 20, Area 18M; ♂ June 22, 1965, Area 19M; 2♂ 1♀ July 22, 1965, Area 18M, Nevada Test Site (D E. Beck, H. H. Knight & J. M. Merino), at black

light. 5♂ 5♀ June 17, 1966, Gerlach, Washoe County, Nevada (W. Gagne), at light. Area JAL6, ♀ Oct. 2, 1961, taken in a can pit-trap; Area JAA3, ♀ Oct. 20, 1961, in a can pit-trap; Area JA, 6♂ 2♀ July 20, 3♂ 1♀ Aug. 7, 1962, at black light; Area CE, 4♂ 2♀ July 21, 1962, at black light; Area CD, 2♂ 2♀ Aug. 7, 1964, at black light; Area M (Mercury), 2♀ Aug. 4, 2♂ 2♀ Aug. 5, 4♂ 1♀ Aug. 15, 1965, at black light; ♂ Aug. 3, ♂ Aug. 10, ♂ Aug. 12, 2♂ Aug. 17, ♂ Aug. 23, 1965, at incandescent light; Area CM, ♂ ♀ June 13, 1965; Area CT, ♂ ♀ June 20, 1965; Area TM, ♂ June 14, 1965; Area 410M, 3♀ July 21, 1965, at incandescent light, Nevada Test Site.

Phytocoris subcinctus, new species

Fig. 311

Runs in the key to the couplet with *sublineatus*, but may be separated by the longer first antennal segment.

Male. Length 6.4 mm, width 1.8 mm. Head: width .94 mm, vertex .48 mm; yellowish, frons with transverse reddish striae; clypeus with geminate mark of reddish lines on base. Rostrum, length 2.48 mm, reaching upon fifth ventral segment, yellowish, apex brownish black. Antennae: segment I, length 1.36 mm, pallid to pale yellowish, ventral surface fuscous, dorsal aspect white, marked with remnants of reticulate lines, leaving four or more sizeable spots of dark brown, set with several erect pallid bristles, which in length scarcely equal diameter of segment; II, 2.4 mm, dark brown, with white annulus at base, a broader pale yellowish band on middle with edges not sharply defined, the dark brown on basal half with two elongate yellowish spots on dorsal aspect; III, 1.7 mm, brownish black, with yellowish white annulus at base; IV, 1.19 mm, dark brown. Pronotum, length .88 mm, width at base 1.53 mm; pallid to white, basal edge white, sub-basal margin with a scalloped fuscous band, which includes six tumid spots, each bearing a tuft of golden brown scale-like hairs; disk rather uniformly dusky white, calli with indistinct reddish lines; propleura white, with reddish or fuscous ray across middle of coxal cleft, which fades out near posterior margin. Mesoscutum rather broadly exposed, pallid, marked with reddish brown on middle. Scutellum pallid, with a pale median line set off by parallel fuscous lines, the latter fading out on apical area; also with secondary fuscous lines, forming elongated fuscous line near margin of disk, but fading out near basal margin. Dorsal

surface clothed with suberect fuscous and some pallid simple hairs, rather abundantly intermixed with appressed and recumbent, white sericeous pubescence; basal margin of pronotum, tip of embolium, apex and point on inner margin of cuneus, spot on inner margin of paracuneus, all bearing a tuft of golden brown or black, erect flat hairs; these black spots are bare in old or badly rubbed specimens.

Hemelytra pallid or white, shaded and marked with fuscous; inner margin of corium, line over radial vein, spots along inner half of clavus, and a few points on embolium, fuscous or black. Membrane opaque white, marked with conspurcate, reticulate and vermiculate patterns of fuscous brown to blackish; spot by apex of cuneus, and a much larger marginal area at middle of apical half, and arcuate band extending behind apex of larger areole, clear of dots and spots; veins pallid except the short one separating the areoles. Mesosternum, except median line, and laterally except spot beneath episternum, fuscous. Legs pallid; front femora with longitudinal line on posterior aspect, and reticulate marks on apical half, brownish black; hind femora brownish black, more blackish above, everywhere marked with small and some larger, irrorate spots, the paler areas with a reticulate pattern of dark lines; front tibiae with three dark brown annuli, the darkest one on apex; posterior tibiae nearly white with reddish brown spots at base of spines, and on basal half with indications of two incomplete annuli on ventral aspect. Venter pallid beneath, sides with numerous dark brown marks and spots, also a well developed black lateral line. Genital segment without tubercles but claspers distinctive (Fig. 311).

Holotype: ♂ Aug. 15, 1929, Richfield, Utah (E. W. Davis), taken at light trap. **Paratypes:** 5♂ taken with the type.

Phytocoris sublineatus, new species

Fig. 312

Runs in the couplet with *subcinctus* but may be separated by the shorter antennal segment I; frons white, without transverse striae.

Male. Length 5.0 mm, width 1.56 mm; pallid to white, vertex with black line each side bordering the eye; frons without transverse striae; clypeus white, with geminate brown lines on base. Rostrum, length 2.4 mm, reaching upon seventh ventral segment. Antennae: segment I, length .98 mm, white, brownish black beneath, dorsal aspect with a few small dots and marks; II, 1.9 mm, dark brown, with white band at

base, middle broadly banded with pale to yellowish, edges not sharply defined, dark area on basal half with two elongate pale spots; III, 1.32 mm, brownish black, with pale band at base; IV, missing. Pronotum, length .75 mm, width at base 1.39 mm; pallid to white, basal submargin of disk with slightly scalloped brownish black band which does not extend to basal angles; calli poorly defined but with dark brown around lateral edges which reaches to anterior angles; propleura white, a dark brown line originating behind eye, extends across middle of coxal cleft and on to basal margin. Mesoscutum moderately exposed, pallid, brownish on middle.

Scutellum pallid to white, brownish on middle but leaving pale median line, a weak brownish line appears parallel to median line, starting at a point nearer basal angle. Dorsal surface clothed with fuscous and some pallid, suberect hairs, thickly intermixed with recumbent and appressed, white sericeous pubescence.

Hemelytra pallid or white, inner margin of corium and a line along apical half of radius, brownish black, lateral submargins of clavus with several fuscous brown spots; cuneus white, with some brown lines and spots on inner margin and apex. Membrane opaque white, marked with conspurcate, reticulate and vermiculate patterns of fuscous brown; spot by apex of cuneus and a much larger area on middle of apical half, clear of dots or marks; veins pale yellowish, except vein separating areoles which is dark fuscous. Mesosternum and pleura brownish black, sides of sternum white, but with dark line dividing the pale area. Legs white, marked with

bands and lines of fuscous brown; front femora with longitudinal line on posterior aspect, apical half with dark spots and marks; hind femora with reticulate patches of dark brown, anterior aspect with oblique pale spots and areas, combine to make the middle area largely pallid white; posterior tibiae white, with two brown spots on ventral aspect near base. Venter pallid to white, sides marked with numerous small brown spots and patches, with larger black spots joining to form a heavy lateral line. Genital segment without tubercles but claspers distinctive of the species (Fig. 312).

Holotype: ♂ July 8, 1930, Richfield, Utah (E. W. Davis), taken in light trap. **Paratype:** ♂ Aug. 13, 1906, Soldier Summit, Utah.

Phytocoris pulchricollis Van Duzee

Phytocoris pulchricollis Van Duzee, 1923:148.

Described from San Marcos Island, Lower California, and now known from Arizona and Nevada.

Records from areas of the Nevada Test Site: 410M, 3♂ July 21, 1965 at incandescent light; CB, 2♂ 2♀ Aug. 7, 1964 at black light; CE, 4♂ 2♀ July 21, 1962 at black light; CM, ♂ ♀ June 13; CT, ♂ ♀ June 20, 1965; JA, 6♂ 2♀ July 20, 3♂ 1♀ Aug. 7, 1962 at black light; JAA3, ♀ Oct. 20, JAL6, ♀ Oct. 2, 1961 in can pit-trap; M, 2♀ Aug. 4, 2♂ 2♀ Aug. 5, 4♂ 1♀ Aug. 15, at black light; ♂ Aug. 3, ♂ Aug. 10, ♂ Aug. 12, 2♂ Aug. 17, ♂ Aug. 23, 1965 at laboratory lights; TM, ♂ June 14, 1965.

Genus *Phytocoris* Fallen

Key to the Species, Section D

1. Length of antennal segment 1 greater than width of head 2
 Length of antennal segment 1 not exceeding width of head 3
2. Rostrum reaching beyond hind coxae; male genital segment without a tubercle above left clasper (Fig. 317); length 5.7 mm *tanneri*, n. sp.
 Rostrum not reaching behind posterior coxae; male genital segment with a wide crested tubercle above base of left clasper (Fig. 314); length 5.8 mm *mcwillae*, n. sp.
3. Front tibiae with four black annuli, counting the black knee 4
 Front tibiae with but three black annuli, the knee pallid; antennal segment 11 with but three white annuli; length 4.1 mm *tricinctus*, n. sp.

4. Antennal segment I black, dorsal aspect with two large white spots and one smaller spot near base; frons with heavy black lines, more black than pallid; length 4.5 mm *contrastus*, n. sp.

Antennal segment I fuscous brown, dorsal aspect with two large pale spots and four or five smaller spots in the brown, sometimes more pallid than brown; frons pallid, each side with reddish brown striate lines; length 4.7 mm *quadricinctus*, n. sp.

Phytocoris tricinctus, new species

Fig. 315

Runs in the key to section D where it may be distinguished by having just three pallid annuli on second antennal segment.

Male. Length 4.1 mm, width 1.6 mm. Head: width .91 mm, vertex .34 mm; white, frons with weak transverse stria; clypeus with red mark on middle and two red dashes on base. Rostrum, length 1.7 mm, just reaching to base of posterior trochanters, pallid, apex brownish black. Antennae: segment I, length .74 mm, pallid, with a few weak brown spots, spines pallid, length not exceeding width of segment; II, 1.7 mm, cylindrical, fuscous, with three pallid annuli, the third one beginning at middle; III, 1.19 mm, fuscous, pale at base; IV, missing. Pronotum, length .65 mm, width at base 1.29 mm; disk pallid, showing numerous setigerous dots; sub-basal margin with an undulating fuscous band, basal edge white; calli indicated by red and brown marks; propleura pallid, a short reddish brown band across middle of coxal cleft. Scutellum pallid, reddish brown spot on middle of base. Dorsal surface clothed with suberect, pale to fuscous simple pubescent hairs, intermixed with recumbent and appressed, silvery sericeous pubescence, also with a sprinkling of and patches of deciduous, brownish black scalelike hairs.

Hemelytra pallid, with fuscous lines developing along claval vein and apical half of radius, elsewhere with minute brownish setigerous dots; margins of cuneus with reddish and fuscous dots, apex more strongly dark brown. Membrane opaque white, the whole area rather uniformly marked with conspurate pattern of fuscous brown dots, a nearly clear spot by apex of cuneus, and a secondary marginal spot at middle of apical half; veins pale, darker about smaller areole. Ventral surface pallid, mesosternum fuscous, episternum with white band that crosses the epimeron. Legs pallid, femora with brownish reticulations, hind femora with fine reticulations only; front and middle tibiae with three fuscous bands, hind tibiae pallid, with small

fuscous dots only. Venter pallid, thickly marked with brownish reticulations. Genital segment pallid, a large brown patch each side at base; a blunt tubercle just above base of left clasper (Fig. 315), right side with very small tubercle.

Female. Length 4.3 mm, width 1.6 mm. Head: width .85 mm, vertex .40 mm. Rostrum, length 1.7 mm, reaching to base of posterior trochanters. Antennae: segment I, length .82 mm; II, 1.7 mm, banded like the male; III, 1.15 mm; IV, missing. Pronotum, length .68 mm, width at base 1.3 mm. Coloration and pubescence very similar to the male.

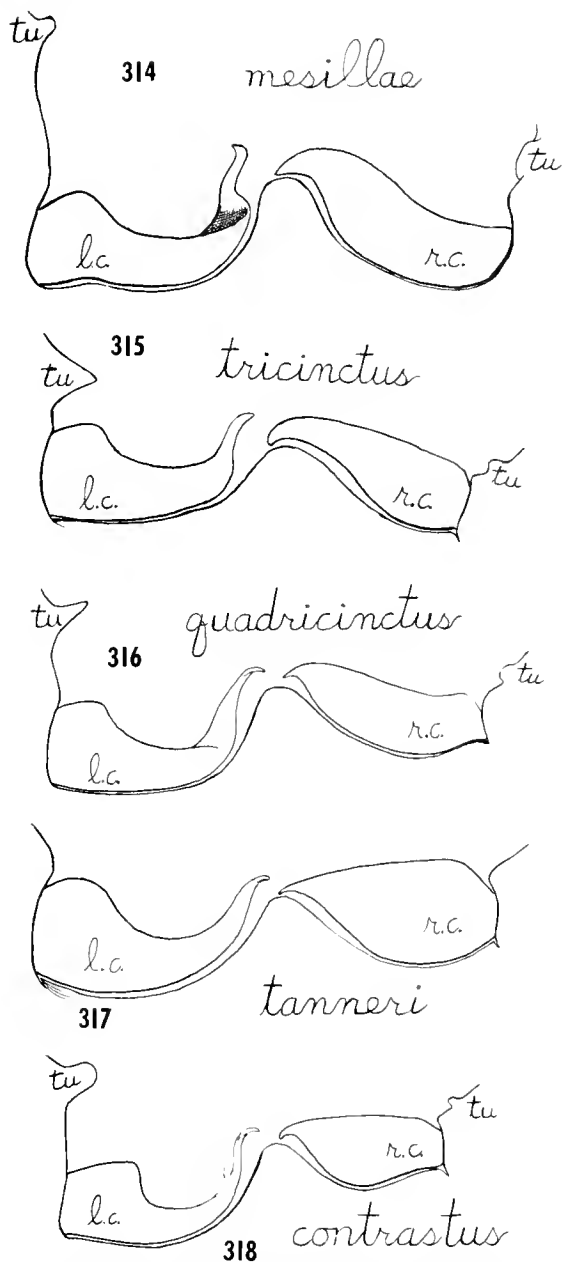
Holotype: ♂ Aug. 1, 1930, Superior, Arizona (E. D. Ball). **Allotype:** ♀ May 12, 1929, Tucson, Arizona (E. D. Ball). **Paratypes:** 5♂ 4 ♀ taken with the type. ♀ taken with the allotype. ♀ April 28, 1925, alt. 4500 ft, Baboquivari Mts., Arizona (A. A. Nichol).

Phytocoris quadricinctus, new species

Fig. 316

Distinguished by the short first antennal segment, and segment II having four white annuli.

Male. Length 4.7 mm, width 1.5 mm. Head: width .78 mm, vertex .36 mm; pallid, frons with four or five short reddish striae on each side. Rostrum, length 1.77 mm, reaching upon base of seventh ventral segment, apex brownish black. Antennae: segment I, length .71 mm, not equal to width of head, bearing several pallid spines, length about equal to width of segment, ventral surface with a thick brush of suberect hairs, pallid, with brown spots, apex reddish brown; II, 1.83 mm, cylindrical, dark brown, basal half with three white annuli plus a dorsal white spot, a fourth pale annulus on apical half, leaving the apical third of segment dark brown; III, .95 mm, fuscous, pale annulus at base; IV, .61 mm, fuscous. Pronotum, length .68 mm, width at base 1.3 mm; pallid, marked and shaded with fuscous and brown; basal submargin of disk with an undulating fuscous band that curves around the tumid high points, two each side of middle.



Figs. 314-318. Male claspers. 314, *Phytocoris mesillae*; 315, *P. tricinctus*; 316, *P. quadricinctus*; 317, *P. tanneri*; 318, *P. contrastus*.

Mesoscutum moderately exposed, dark fuscous brown, a pale spot at each side. Scutellum moderately convex, pallid, dark brown at middle of base, a fuscous spot each side before apex.

Dorsal surface clothed with suberect, pale to fuscous simple pubescent hairs, intermixed with patches of recumbent and appressed, silvery sericeous pubescence, also with a sprinkling and patches of deciduous, brownish black scalelike hairs. Hemelytra pallid, marked with dots and

spots of fuscous, spots along claval vein, and dots thicker on apical area of corium; cuneus with reddish dots along outer margin, apex with a dark spot. Membrane pale white, everywhere rather thickly marked with reticulate and conspurcate pattern of fuscous brown, a small clear spot at apex of cuneus; veins pale dusky, vein between areoles dark brown. Mesosternum and a bar extending back across epimera brownish black. Legs pallid, front femora with spots and broken lines of fuscous; front tibiae pallid, with four fuscous bands, first one at base, also four white bands, the apical one covering apex of tibia; middle femur chiefly pallid, apex dark brown, forming a dark bar above, middle tibia black at base; hind femora pallid on basal half above, ventral half with dark brown spots and reticulations, apical one-third brownish black above; hind tibiae pallid, with small dark spots but with well developed dark band near base, and a weaker band at middle. Venter pallid, with rather broad brownish black lateral stripe, becoming black on sides on genital segment. Genital segment and claspers distinctive (Fig. 316), a small tubercle high above base of left clasper.

Female. Length 3.8 mm, width 1.5 mm. Head: width .82 mm, vertex .40 mm. Rostrum, length .8 mm, reaching upon sixth ventral segment. Antennae: segment I, length .78 mm; II, .9 mm, marked like the male; III, 1.10 mm, fuscous, pale at base; IV, .64 mm, fuscous. Pronotum, length .62 mm, width at base 1.25 mm. Color and pubescence very similar to the male.

Holotype: ♂ May 9, 1926, alt. 1300 ft, Salt River Mts., Arizona (A. A. Nichol). **Allotype:** ♀ same data as the type. **Paratypes:** 2 ♀ taken with the types. ♀ May 3, 1927, Terlingua, Brewster County, Texas (J. O. Martin).

Phytocoris tanneri, new species
Fig. 317

This species runs in section D, in the couplet with *mesillae*, from which it may be separated by the longer rostrum, and male genital segment without a tubercle above base of left clasper (Fig. 317).

Male. Length 6.4 mm, width 1.9 mm. Head: width .95 mm, vertex .44 mm; frons with oblique and transverse reddish brown lines each side of vertex; base of clypeus with a Y-shaped red brown mark. Rostrum, length 2.6 mm, reaching upon fifth ventral segment, pallid to yellowish brown, apex brownish black. Antennae: segment I, length 1.53 mm, pallid, ventral surface fuscous, dorsal aspect with many small red dots and

several larger brown spots, spines pale to yellowish, length not exceeding width of segment; II, 2.6 mm, yellowish brown to dark brown, with a broad pale band at base, next to this a broad band that is wider on dorsal aspect, sometimes just barely cuts the ventral part, and at middle a broad pale to yellowish band without clear cut edges; III, 1.7 mm, yellowish brown, paler at base; IV, 1.3 mm, fuscous brown. Pronotum, length .95 mm, width at base 1.63 mm; pallid, tinted yellow, basal edge of disk white, bordered in front by an undulating black line, which includes three slightly elevated tumid points each side of the median line; calli rather flat, edges indicated by reddish brown color; disk clothed with suberect black hairs, intermixed with recumbent silvery sericeous pubescence; the sub-basal, undulating black band has dense clumps of black hairs set upon the elevated black spots. Mesoscutum broadly exposed, colored and marked with reddish and brown, rather densely clothed with silvery sericeous pubescence. Scutellum pallid or pale yellowish, with geminate fuscous lines on basal half, set at middle and leaving a pale median line; either side of median line is another irregular longitudinal mark that divides the remaining space.

Hemelytra pallid but marked with fuscous dots and lines; clavus chiefly pallid but with many dots paralleling the claval suture; corium with numerous dots and spots on inner third, also with spots uniting to form a line on apical half of radius; embolium with a series of reddish brown spots; cuneus pallid, with black spot at base and middle of inner edge, the apex broadly dark; clothed like the pronotum with suberect black hairs and intermixed with recumbent, silvery sericeous pubescence. Membrane opaque white, rather uniformly marked with reticulate, conspurcate and vermiculate patterns of fuscous to black; radial vein reddish brown, vein separating areoles dark fuscous; a white spot at tip of cuneus, bounded behind by a solid fuscous spot, and behind that a triangular white spot on margin. Ventral surface pallid, variously marked and shaded with brown and fuscous; mesosternum dark fuscous to black. Coxae pallid; femora pallid, front pair with two longitudinal fuscous lines on postero-dorsal aspect; hind femora pallid, with a reticulate pattern of brown lines, dorsal aspect nearly solid brown with a few pale dots left; hind tibiae nearly white, with small dots and two large ones near base; front tibiae triannulate with fuscous, the widest band on apex; tarsi fuscous, middle segment pallid. Venter pallid, marked with numerous red brown

spots, a broad lateral line indicated by dark brown. Genital segment and claspers distinctive (Fig. 317) without a tubercle above base of left clasper.

Holotype: ♂ July 15, 1929, Richfield, Utah (E. W. Davis), taken in light trap. **Paratypes:** 6♂ taken with the type. ♂ July 30, 1930, Richfield, Utah (E. W. Davis), at light trap. ♂ Sept. 7, 1931, Gallup, New Mexico (H. H. Knight), taken at light.

This well-marked species, taken chiefly in Utah, is named for Dr. Vasco M. Tanner of Brigham Young University, who has done so much to advance our knowledge of general entomology and especially of the Coleoptera of the Great Basin.

Phytocoris mesillae, new species

Fig. 314

Allied to *tanneri* but distinguished by the shorter rostrum and the male genital segment with a wide crested tubercle above base of left clasper (Fig. 314).

Male. Length 6.1 mm, width 1.9 mm. Head: width 1.09 mm, vertex .44 mm; frons with incomplete transverse striae, a strong transverse brown line just above base of clypeus. Rostrum, length 2.2 mm, just reaching upon apex of posterior coxae. Antennae: segment I, length .46 mm, set with pallid erect spines which in length exceed thickness of segment, pale yellowish brown, with several darker brown spots having brown pubescent hairs; II, 2.5 mm, dark brown, with two white annuli or semibands on basal one-third, and a slightly broader pale band beginning at middle; III, 1.7 mm, fuscous brown, pale at base; IV, .98 mm, fuscous. Pronotum, length .82 mm, width at base 1.46 mm; pallid, disk with many small brown dots, calli outlined by brown lines; propleura pallid, with a brown line crossing middle of coxal cleft, and extending beyond as a curved ray; disk clothed with suberect, short fuscous hairs, intermixed with varying amounts of deciduous black scalelike hairs; sub-basal margin with undulating fuscous band, that fits around four tumid or slightly elevated spots, two each side of middle line; also with some silvery sericeous pubescence on the pallid basal edge. Mesoscutum moderately exposed, fuscous brown, a paler spot each side. Scutellum distinctly convex, pallid, median line fuscous brown on base.

Hemelytra pallid, marked with dusky brown dots and spots; clothed with suberect, brownish black pubescent hairs, intermixed with varying

amounts of deciduous, brownish black scalelike hairs. Membrane opaque white, intermixed with fine conspurcate and reticulate dots and marks, veins dusky. Ventral surface pallid, mesosternum fuscous or dark brown. Legs pallid, marked with dark brown; front tibiae with three white bands or, say four dark bands, with dark color at base and apex; middle femora nearly white, but with a few dark spots on apical half; hind femora pale, apical half with reticulate pattern of reddish brown to brown; hind tibiae pallid, marked with many small dots and spots of brown, but no well defined bands; tarsi fuscous, middle segment pallid. Venter pallid, sides marked with reddish dots and patches of brown; genital segment with a broad crested type of tubercle well above base of left clasper (Fig. 314).

Holotype: ♂ July 12, 1917, Mesilla Park, New Mexico (H. H. Knight), taken at light. **Paratype:** ♂ taken with the type specimen at light.

Phytocoris contrastus, new species
Fig. 318

Runs in the key to Section D, and to the couplet with *quadricinctus*; distinguished by the contrasting white and black colors; antennal segment I black, with three large white spots on dorsal aspect.

Male. Length 4.5 mm, width 1.4 mm. Head: width .75 mm, vertex .34 mm; pallid, frons with heavy black striate lines, sometimes merging to become solid black. Rostrum, length .7 mm, pale yellowish, apex brownish black, reaching upon posterior trochanters. Antennae: segment I, length .64 mm, black, with two large white spots above and a smaller one near base, clothed with white and black hairs and bristles, hair thicker on ventral aspect, like a brush; II, 1.60 mm, basal half white, with three or four fuscous bands, sometimes one fuscous band is eliminated, also one white band on apical half, apical one-fourth black; III, .02 mm, black, pale at base; IV, .61 mm, blackish. Pronotum, length .64 mm, width at base 1.16 mm; disk pallid, shaded and marked with black, sub-basal margin with undulating black band, two scallops each side of median line curve around tumid elevations; calli and

anterior angles chiefly black. Mesoscutum moderately exposed, black, a pale spot each side. Scutellum pallid, median line at base, and a ray each side on apical half, black. Dorsal surface clothed with both pallid and black suberect simple hairs, intermixed with recumbent and appressed, silvery, sericeous pubescence, also interspersed with deciduous, black scalelike hairs.

Hemelytra pallid, outer half of clavus and inner half of corium with reticulate patches of fuscous spots, apical half of corium crowded with black spots and reticulations; dots on embolium and outer edge of cuneus, reddish, a touch of orange shading on outer apical angle of corium. Membrane opaque white, whole area including areoles marked with conspurcate and reticulate brownish dots, with a spot behind apex of cuneus and a second spot at middle of apical half, having fewer or none of the dots; veins pallid except between areoles, a small orange colored spot on base of larger areole. Ventral surface white and marked with black; mesosternum black, with a white ray across the episternum. Legs white, apical third of femora black, the black on hind femora with three white spots above, basal half with irregular dark marks beneath; front and middle tibiae white, with three black annuli, not counting black knees and touch of fuscous on apex; tarsi black, middle segment pallid. Venter pallid, sides marked with brownish and black, with a narrow black lateral line; genital segment pallid, black on base and sides; with a blunt tubercle high above base of left clasper, right side with a minute tubercle (Fig. 318).

Female. Length 3.9 mm, width 1.5 mm. Head: width .78 mm, vertex .44 mm. Rostrum, length 1.8 mm, reaching upon posterior trochanters. Antennae: segment I, length .58 mm; II, 1.60 mm; III, .58 mm; IV, missing. Pronotum, length .52 mm, width at base 1.12 mm. Coloration and pubescence very similar to the male.

Holotype: ♂ July 19, 1965, Area 5M, Nevada Test Site (D. E. Beck, J. M. Merino), at black light. **Allotype:** ♀ same data as the type. **Paratypes:** ♂ taken with the type. ♂ Aug. 3, 1962, Area EC13, Nevada Test Site, at black light.

SUMMARY

Approximately 5,000 specimens of plant bugs were collected at the Nevada Test Site between 1959 and 1965. Greatest emphasis was given to

collecting from June 10-24, 1965, when the desert areas at the test site were unusually profuse with blooming vegetation. A total of 160

species representing 50 genera was taken at the test site. Of these, 7 genera and 96 species are new to science.

Comparative data for these and additional species from other parts of western North America are also included. These represent an additional 449 species, of which 5 genera and 148 species are new to science. Altogether, 612

species of 122 genera are included in taxonomic keys to the subfamilies, genera, and species of western North America, including a total of 245 new species.

Distribution data are provided for each species, and host plant relationships are designated when known.

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"	<i>calli</i>	240	"	<i>rolfsi</i>	216
"	<i>calvus</i>	240	"	<i>roseipennis</i>	215
"	<i>candidus</i>	215	"	<i>roseotinctus</i>	229
"	<i>canescens</i>	223	"	<i>roseus</i>	249
"	<i>carnosulus</i>	229	"	<i>rostratus</i> , n. sp.	253
"	<i>cercocarpi</i>	229	"	<i>rubroornatus</i>	216
"	<i>chiricahuae</i> , n. sp.	239	"	<i>rufoscriptus</i>	215
"	<i>commissuralis</i>	250	"	<i>santaritae</i> , n. sp.	245
"	<i>comulus</i>	223	"	<i>seminotatus</i>	216
"	<i>consors</i>	216	"	<i>simulatus</i>	225
"	<i>conspurcatus</i>	240	"	<i>sonorensis</i>	249
"	<i>contrastus</i> , n. sp.	259	"	<i>squamosus</i>	215
"	<i>cunealis</i>	215	"	<i>stellatus</i>	225
"	<i>cuneotinctus</i>	216	"	<i>stitti</i>	228
"	<i>decurvatus</i> , n. sp.	225	"	<i>strigosus</i>	250
"	<i>deserticola</i> , n. sp.	251	"	<i>subcinctus</i> , n. sp.	254
"	<i>difformis</i>	239	"	<i>sublineatus</i> , n. sp.	254
"	<i>empirensis</i> , n. sp.	246	"	<i>tanneri</i> , n. sp.	257
"	<i>ephedrae</i>	216	"	<i>tenuis</i>	215
"	<i>flavellus</i> , n. sp.	234	"	<i>tinctus</i>	225
"	<i>flaviatus</i> , n. sp.	241	"	<i>tricinctipes</i> , n. sp.	230
"	<i>formosus</i>	223	"	<i>tricinctus</i> , n. sp.	256
"	<i>fraterculus</i>	235	"	<i>umbrosus</i>	225
"	<i>fuscipennis</i>	216	"	<i>utahensis</i>	240
"	<i>fuscosignatus</i>	216	"	<i>validus</i>	235
"	<i>geniculatus</i>	216	"	<i>vanduzeei</i>	217
"	<i>gracillatus</i> , n. sp.	229	"	<i>varius</i>	235
"	<i>heidemanni</i>	229	"	<i>vau</i>	249
"	<i>hesperellus</i> , n. sp.	232	"	<i>ventralis</i>	216
"	<i>hesperius</i>	229	"	<i>vinaceus</i>	249
"	<i>hirsuticus</i> , n. sp.	223	"	<i>vividus</i>	216
"	<i>hirtus</i>	223	"	<i>yuma</i>	250
"	<i>histriculus</i>	249	<i>Pilophoropsis</i>	<i>balli</i> , n. sp.	158
"	<i>hopi</i>	249	"	<i>brachypterus</i>	159
"	<i>ingens</i>	235	"	<i>nicholi</i>	159
"	<i>interspersus</i>	216	<i>Pilophorus</i>	<i>balli</i> , n. sp.	176
"	<i>jucundus</i>	225	"	<i>barberi</i> , n. sp.	171
"	<i>juniperanus</i> , n. sp.	238	"	<i>chiricahuae</i> , n. sp.	172

"	<i>clavicornis</i>	168	<i>Pyncocoris ursinus</i>	205
"	<i>crassipes</i>	167	<i>Pyncoderes atratus</i>	77
"	<i>diffusus</i> , n. sp.	168	" <i>quadrimaculatus</i>	77
"	<i>discretus</i>	168	<i>Ranzovius moerens</i>	35
"	<i>dislocatus</i> , n. sp.	171	<i>Reuteroscopus dreisbachi</i>	55
"	<i>exiguus</i>	168	<i>Rhinacloa forticornis</i>	35
"	<i>fuscipennis</i>	168	<i>Semium subglaber</i>	88
"	<i>hesperus</i> , n. sp.	169	<i>Schaffneria schaffneri</i>	156
"	<i>jezzardi</i> , n. sp.	170	<i>Sericophanes fuscicornis</i> , n. sp.	160
"	<i>longisetosus</i> , n. sp.	174	" <i>nevadensis</i> , n. sp.	160
"	<i>merinoi</i> , n. sp.	175	" <i>rubripes</i> , n. sp.	161
"	<i>microsetosus</i> , n. sp.	169	" <i>triangularis</i>	160
"	<i>nevadensis</i> , n. sp.	172	" <i>tumidifrons</i> , n. sp.	160
"	<i>opacus</i>	168	<i>Sixeonotus hebbiae</i> , n. sp.	76
"	<i>salicis</i> , n. sp.	173	" <i>dextratus</i>	76
"	<i>schwarzi</i>	167	" <i>insignis</i>	76
"	<i>tanneri</i> , n. sp.	173	" <i>nicholi</i>	76
"	<i>tibialis</i>	168	<i>Slaterocoris croceipes</i>	90
"	<i>tomentosus</i>	168	" <i>longipennis</i> , n. sp.	90
"	<i>utahensis</i> , n. sp.	175	" <i>robustus</i>	90
"	<i>vicarius</i>	168	" <i>rubrofemoratus</i> , n. sp.	90
<i>Finalitus approximatus</i>		187	" <i>sheridani</i> , n. sp.	92
" <i>brevirostris</i> , n. sp.		187	" <i>stygius</i>	90
" <i>ealifornicus</i> , n. sp.		189	" <i>utahensis</i> , n. sp.	92
" <i>rubrotinctus</i> , n. sp.		189	<i>Spanagonicus albofasciatus</i>	31
" <i>solicagus</i>		188	<i>Squamocoris</i> , n. gen.	31
" <i>utahensis</i> , n. sp.		188	" <i>arizonae</i> , n. sp.	109
<i>Pithanus maerkeli</i>		177	" <i>utahensis</i> , n. sp.	108
<i>Plagiognathus salviae</i> , n. sp.		30	<i>Stenodema virens</i>	178
<i>Platylygus vanduzeei</i>		192	<i>Stenotus binotatus</i>	203
<i>Poecilocapsus nigriger</i>		204	<i>Stittocapsus franseriae</i>	205
<i>Polymerus diffusus</i>		186	<i>Taedia parenthesis</i>	205
" <i>relativus</i>		186	" <i>virgulatus</i>	205
<i>Porpomirus curtulus</i>		179	<i>Teleorhinus brindleyi</i> , n. sp.	65
<i>Prepops atripennis</i>		182	" <i>cyaneus</i>	65
" <i>bivittis</i>		181	" <i>nigricornis</i> , n. sp.	66
" <i>rubroscutellatus</i>		182	" <i>oregoni</i> , n. sp.	66
" <i>rubrovittatus</i>		182	" <i>utahensis</i> , n. sp.	65
<i>Psallus atriplicis</i> , n. sp.		48	<i>Teratocoris discolor</i>	179
" <i>merinoi</i> , n. sp.		47	" <i>saundersi</i>	179
" <i>purshiae</i> , n. sp.		48	<i>Trigonotylus americanus</i>	179
<i>Pseudatomoscelis seriatus</i>		55	<i>Tropidosteptes illitus</i>	187
<i>Pseudopsallus angularis</i>		103	" <i>vittifrons</i>	186

KNOWN PLANT HOST – BUG ASSOCIATIONS AND STATE

<i>Abronia elliptica</i>	<i>Amaranthus palmeri</i>
<i>Hesperocapsus abroniae</i> : Colorado	<i>Ganocapsus filiformis</i> : Arizona
<i>Acacia greggii</i>	<i>Anogra coronopifolia</i>
<i>Atractotomus acaciae</i> : Arizona	<i>Hesperocapsus anograe</i> : Colorado
<i>Phytocoris acaciae</i> : Arizona, New Mexico, Texas	<i>Artemisia</i>
<i>Phytocoris difformis</i> : Arizona	<i>Deraeocoris (Camptobrochis) brevis</i> : Nevada
<i>Adenostegia filifolia</i>	<i>Europiella yampae</i> : Colorado
<i>Phytocoris formosus</i> : California	<i>Melanotrichus shoshonea</i> : Wyoming
<i>Adenostoma</i>	<i>Melanotrichus tibialis</i> : Nevada
<i>Parthenicus picicollis</i> : California	<i>Parthenicus utahensis</i> : Nevada
<i>Adenostoma fasciculatum</i>	<i>Slaterocoris robustus</i> : Utah
<i>Phytocoris rau</i> : California	<i>Artemisia californica</i>
<i>Agave</i>	<i>Melanotrichus tibialis</i> : California
<i>Caulotops harberi</i> : Arizona	<i>Artemisia filifolia</i>
<i>Agave palmeri</i>	<i>Hesperocapsus artemisicola</i> : Colorado
<i>Caulotops agavis</i> : Arizona	<i>Artemisia tridentata</i>
<i>Agropyron repens</i>	<i>Chlamydatum becki</i> : Utah
<i>Capsus ater</i>	<i>Deraeocoris schwarzi</i> : Nevada, Utah
<i>Allium</i>	<i>Europiella decolor</i> : California, Colorado, Nevada,
<i>Labopidca allii</i>	Utah

- Europiclla nigricornis*: Nevada
Europiclla stigmosa: Nevada, Utah, Colorado
Europiclla unipunctata: Nevada, Utah
Hesperocapsus davisii: Nevada
Lopidea fuscata: Nevada
Lygus desertinus: Nevada
Melanotrichus nevadensis: Nevada
Phyllopidia montana: Colorado
Phyllopidia picta: Utah
Phytocoris albiscutellatus: Nevada
Slaterocoris robustus: Colorado, Nevada
Slaterocoris rubrofemoratus: Nevada
Spanagonicus alhofasciatus: Nevada
Astragalus lentiginosus
Lygus desertinus: Nevada
Atriplex
Megalopsallus rubropictipes: Nevada
Parthenicus atriplicis: Nevada
Parthenicus mundus: California
Atriplex canescens
Europiclla nigrofemoratus: Nevada
Europiclla punctipes: Nevada
Europiclla sparsa: Nevada
Lygus desertinus: Nevada
Melanotrichus atriplicis: Nevada
Parthenicus atriplicis: Nevada
Parthenicus cuncotinctus: Nevada
Phytocoris brevatus: Nevada
Phytocoris consors: Nevada
Phytocoris cuncotinctus: Nevada
Phytocoris hirsuticus: Nevada
Psallus atriplicis: Nevada
Atriplex confertifolia
Parthenicus cuncotinctus: Nevada
Atriplex polycarpa
Melanotrichus stitti: Arizona
Baccharis linearis
Sericophanes fuscicornis: Arizona
Baileya multiradiata
Lygus desertinus: Nevada
Bebbia juncea
Sisonotus bebbiae: Arizona
Berula crecta
Lygus hesperus: Nevada
Bigelovia
Europiclla pilosula: Utah
Bouteloua gracilis
Parthenicus boutelouae: Arizona
Carex
Teratocoris discolor
Castilleja
Lygus desertinus: Nevada
Ceanothus fendleri
Parthenicus oreades: Arizona, Colorado
Cercidium Torreyanum
Neurocolpus simplex: California
Cercocarpus parvifolius
Atractotomus cercocarpi: Colorado, New Mexico
Phytocoris cercocarpi: Colorado
Cercocarpus paucidentatus
Parthenicus cercocarpi: Arizona
Chaenactis
Coquillettia luteiclava: Nevada
Hesperocapsus stitti: Arizona
Chaenactis stecioidea
Brachyteratocoris nevadensis: Nevada
Lopidea knowltoni: Nevada
Lygus desertinus: Nevada
Chamaebatiaria foliosa
Dicyphus usingeri: California
Chenopodium
Atomoscelis modestus: Arizona
Chenopodium atrovirens
Melanotrichus pallens: Nevada
Chenopodium fremonti
Lygus desertinus: Nevada
Melanotrichus coagulatus: Nevada
Chenopodium leptophyllum
Lygus desertinus
Melanotrichus coagulatus: Nevada
Rhinacloa forticornis: Nevada
Chrysothamnus
Dracocoris (Camptobrochis) bakeri: Nevada
Europiclla angulata: Colorado
Nevadocoris bullatus: Nevada
Phyllopidia utahensis: Utah
Pilophorus nevadensis: Nevada
Pilophorus opacus: Colorado
Polymerus relativus: Utah
Slaterocoris croceipes: Colorado, Utah
Chrysothamnus nauscosus
Beckocoris laticephalus: Nevada
Europiclla albipubescentis: Nevada
Lopidea knowltoni: Nevada
Rhinacloa forticornis: Nevada
Slaterocoris croceipes: Nevada
Chrysothamnus paniculatus
Rhinacloa forticornis: Nevada
Chrysothamnus parryi
Rhinacloa forticornis: Nevada
Chrysothamnus viscidiflorus
Lopidea deserta: Nevada
Lygus desertinus: Nevada
Phytocoris rostratus: Nevada
Lygus clisus: Nevada
Lygus hesperus
Oncerometopus nigriclavatus: Nevada
Parthenicus trispinosus: Nevada
Polymerus relativus: Nevada
Clematis ligusticifolia
Malticus intermedius: Colorado, New Mexico
Covillea (synonym of *Larrea*)
Parthenicus covilleae: California
Cowania stansburiana
Parthenicus cowanic: Arizona
Croton
Pseudatomoscelis seriatus: Nevada
Dactylis glomerata
Stenotus binotatus
Dalea
Daleapidea albescens: Arizona
Dalea emoryi
Daleapidea albescens: California
Dalea polyadenia
Ceratopidea daleae: Nevada
Daleapidea daleae: Nevada
Dichactocoris peregrinus: Nevada
Dalea schottii
Daleapidea daleae: California
Daubentonia longifolia
Creontiades debilis
Digitalis purpurea
Dicyphus pallicornis: British Columbia, Washington
Diplacus longifloris
Dicyphus diplaci: California

- Elymus cinereus*
Lygus desertinus: Nevada
Ephedra nevadensis
Ankylotylus pallipes: Nevada
Lopidea scutata: Nevada
Merinocapsus ephedrac: Nevada
Phytocoris becki: Nevada
Phytocoris ephedrac: Nevada
Encelia farinosa
Oncerometopus nigriclavus: California
Eriogonum
Lygus desertinus: Nevada
Rhinacloa forticornis: Nevada
Eriogonum deflexum
Coquillettia albella: Nevada
Lygus desertinus: Nevada
Lygus hesperus: Nevada
Melanotrichus coagulatus: Nevada
Rhinacloa forticornis: Nevada
Eriogonum fasciculatum
Lopidea becki: Nevada
Eriogonum inflatum
Coquillettia albella: Nevada
Lygus hesperus: Nevada
Eriogonum nodosum
Lygus hesperus: Nevada
Rhinacloa forticornis: Nevada
Eriogonum umbellatum
Lopidea becki: Nevada
Eucnide cordata
Macrolophus lopezi: California
Euphorbia albomarginata
Sesuvium subglaber: Nevada
Eurotia lanata
Melanotrichus eurotiae: Nevada
Franseria acanthicarpa
Chlamydatus associatus: Nevada
Lygus desertinus: Nevada
Lygus elisus: Nevada
Rhinacloa forticornis: Nevada
Spanagonicus albofasciatus: Nevada
Franseria dumosa
Phytocoris albiceps: Arizona
Stittocapsus franseriae: Arizona
Fraxinus
Tropidosteptes illitus: California
Tropidosteptes vittifrons: Nevada
Fraxinus arizonicus
Tropidosteptes vittifrons: Arizona
Galium angustifolia
Prepops bivittis: California
Gaura coccinea
Hesperocapsus guarae: Colorado, South Dakota
Grayia spinosa
Europicella grayiae: Nevada
Lygus desertinus: Nevada
Nevadocoris pallidus: Nevada
Phytocoris flavellus: Nevada
Phytocoris geniculatus: Nevada
Phytocoris merinoi: Nevada
Guardiola platyphylla
Sixconotus dextratus: Arizona
Gutierrezia microcephala
Parthenicus brevicornis: Nevada
Hymenoclea
Coquillettia luteiclara: Nevada
Hymenoclea salsola
Phytocoris merinoi
Hyptis emoryi
Parthenicus nicholi: Arizona
Iva xanthifolia
Atomoscelis modestus: Colorado
Juniperus
Bolteria speciosa: California
Dichrooscytus fuscognatus: Colorado
Dichrooscytus irroratus
Dichrooscytus nitidus: Colorado
Phytocoris varius: Arizona, Colorado
Schaffneria schaffneri: Texas
Juniperus monosperma
Dichaetocoris spinosus: Arizona
Juniperus osteosperma
Bolteria juniperi: Nevada
Bolteria speciosa: Nevada
Dichaetocoris juniperi: Nevada
Dichrooscytus apicalis: Nevada
Dichrooscytus flavicinctus: Nevada
Dichrooscytus junipericola: Nevada
Parthenicus tenuis: Nevada
Phytocoris juniperanus: Nevada
Juniperus pachyphloea
Dichaetocoris spinosus: Arizona
Juniperus sibirica
Dichrooscytus ruberellus: Colorado
Larrea
Parthenicus covilleae: Arizona
Larrea divaricata
Parthenicus covilleae: Nevada
Phytocoris nigripubescentis: Nevada
Larrea glutinosa
Parthenicus covilleae: Texas
Lepidium
Lygus desertinus: Nevada
Lepidium fremontii
Lygus desertinus: Nevada
Lupinus andersonii
Dacerta inflata: California
Lupinus argenteus
Lygus desertinus: Nevada
Lycium
Europicella rufiventris: Arizona
Europicella viridiventris: Arizona
Lycium andersonii
Europicella lycii: Nevada
Lycium richi
Europicella humeralis: California
Phytocoris loretoensis: California
Lycium torreyi
Europicella nicholi: Arizona
Malacothrix
Phytocoris plenus: Arizona
Malacothrix glabrata
Chlamydatus associatus: Nevada
Hesperocapsus plagiatas: Nevada
Lygus desertinus: Nevada
Rhinacloa forticornis: Nevada
Malvastrum fasciculatum
Melanotrichus malvastris: California
Manzanita
Phytocoris vinaceus: California
Martynia parviflora
Dicyphus stitti: Arizona
Mimulus cardinalis
Cyrtopeltis (Usingerella) simplex: Arizona
Macrolophus mimuli: Arizona

- Nicotiana trigonophylla*
Dicyphus minimus: Arizona
Nolina microcarpa
Halticotoma nicholi: Arizona
Oenothera californica
Bifidungulus puberus: Nevada
Lygus desertinus: Nevada
Panicum huachucae
Porpomiris curtulus: Colorado
Phacelia crenulata
Hoplomachidea consors: Nevada
Phacelia ramosissima
Dicyphus phaceliae: Nevada
Phileum pratense
Capsus ater
Stenotus binotatus
Picea
Orthotylus piceicola: Colorado
Pinalitus approximatus
Phytocoris mirus: Colorado
Phytocoris piceicola: Idaho, California, Colorado
Picea engelmanni
Pinalitus brevisrostris: Colorado
Pinus
Largidea gerhardi: Colorado
Largidea grossa: California
Largidea rubida: Colorado, Arizona
Lepidopsallus arizonae: Arizona
Lepidopsallus hesperus: Idaho, California, Wyoming
Lepidopsallus longirostris: Colorado, Wyoming, Arizona
Lepidopsallus monticola: Arizona, Colorado
Parthenicus pinicola: Arizona
Pinus aristata
Phytocoris stellatus: Colorado
Pinus edulis
Lepidopsallus pini: Colorado
Parthenicus pinicola: Colorado
Phytocoris comulus: Arizona, Colorado, Nebraska, New Mexico
Phytocoris simulatus: Colorado, New Mexico
Pilophorus fuscipennis: Arizona, Colorado
Pilophorus hesperus: Colorado
Pilophorus jezzardi: Colorado
Pinus flexilis
Parthenicus fuscus: Arizona
Pilophorus hesperus: Wyoming
Pinus monophylla
Ceratocapsus nigrocinctus: Nevada
Dichaetocoris merinoi: Nevada
Dichaetocoris nevadensis: Nevada
Dichaetocoris pinicola: Nevada
Dichrooscytus pinicola: Nevada
Largidea nevadensis: Nevada
Lepidopsallus pini: Nevada
Lopidea scutata: Nevada
Parthenicus pinicola: Nevada
Phytocoris mellarius: Nevada
Phytocoris trilineatus: Nevada
Pilophorus merinoi: Nevada
Pilophorus microstictus: Nevada
Platylagus vanduzeei: Nevada
Pinus murrayana
Largidea shoshonae: Wyoming
Pinus ponderosa
Largidea stitti: Arizona
Phytocoris heidemanni: Colorado
Pilophorus dislocatus: Colorado
Pilophorus hesperus: Colorado
Platylagus vanduzeei: Arizona, Colorado
Pinus resinosa
Dichrooscytus suspectus
Pinus scopulorum
Pilophorus hesperus: Colorado
Pinus sylvestris
Dichrooscytus rufipennis: New York
Pinus virginiana
Dichrooscytus suspectus
Poa compressa
Capsus ater
Polemonium humile
Dicyphus brachypterus: Washington
Populus latifolia
Orthotylus angulatus: Colorado, Utah
Orthotylus ute: Colorado
Populus tremuloides
Orthotylus (Neomecomma) candidatus: Minnesota
Prosopis
Microphylidea prosopidis: Arizona
Phymatopsallus prosopidis: Arizona
Phytoconis lenis: California
Prosopis juliflora
Microphylidea prosopidis: Nevada, Utah
Neurocolpus arizonae
Orthotylus vigilax: California
Phymatopsallus prosopidis: Nevada
Purshia tridentata
Atractotomus purshiae: Nevada
Ceratocapsus fusiformis: Nevada
Deracocoris bullatus: Nevada
Deracocoris fulgidus: Nevada
Psallus purshiae: Nevada
Quercus agrifolia
Lepidopsallus ovatus: Arizona, California
Quercus emoryi
Lepidopsallus nicholi: Arizona
Quercus oblongifolia
Phytocoris pulchellus: Arizona
Ribes
Dicyphus ribesi: Nevada
Lygus desertinus: Nevada
Parthenicus ribesi: Colorado
Phymatopsallus ribesi: Nevada
Robinia
Atractotomus albidicoxis: Arizona
Rubus odoratus
Dicyphus rubi: New York
Rudbeckia columnaris
Horcias sexmaculatus
Rumex salicifolius
Lygus desertinus: Nevada
Lygus hesperus: Nevada
Rhinacloa forticornis: Nevada
Salazaria mexicana
Larinocerus halius: Nevada
Nevadocoris bullatus: Nevada
Phytocoris merinoi: Nevada
Phytocoris nigrolineatus: Nevada
Salicornia
Megalopsallus nuperus: California
Salix
Orthotylus fuscicornis: Colorado
Pilophorus salicis: Colorado
Salix goodingii
Lygus hesperus: Nevada

- Salsola kali*
Lygus elisus: Nevada
Salvia apiana
Poecillocapsus nigriger: California
Salvia dorrii
Macrotylus salviae: Nevada
Plagiognathus salviae: Nevada
Salvia mellifera
Phytocoris californicus: California
Sambucus
Neurocolpus jessiae
Scirpus
Teratocoris discolor
Sphaeralcea
Ceratocapsus nevadensis: Nevada
Lygus desertinus: Nevada
Melanotrichus azteci: Arizona
Oncotylus guttulatus: Nevada
Rhinacloa forticornis: Nevada
Stachys albens
Dicyphus hesperus: California
Stanleya pinnata
Dichaetocoris stanleyana: Nevada
Lygus desertinus: Nevada
Lygus elisus: Nevada
Lygus hesperus: Nevada
Rhinacloa forticornis: Nevada
Symphoricarpos longifloris
Dichaetocoris symphoricarpi: Nevada
Microphylellus symphoricarpi: Nevada
Tamarix pentandra
Lygus hesperus: Nevada
Rhinacloa forticornis: Nevada
Tetradymia
Chlamydatus monilipes: Nevada
Lopidea deserta: Nevada
Tetradymia axillaris
Lygus desertinus: Nevada
Tetradymia glabrata
Lygus desertinus: Nevada
Nevadocoris beeki: Nevada
Rhinacloa forticornis: Nevada
Slaterocoris longipennis: Nevada
Verbascum virgatum
Dicyphus hesperus: Nevada
Viguiera multiflora
Chlamydatus associatus: Nevada
Hadronema picta: Nevada
Yucca
Halticotoma valida: Arizona, California, Colorado, Oklahoma, Texas, Utah

STATE DISTRIBUTION OF WESTERN SPECIES OF MIRIDAE

(* = new species, ** = new genus and species, *** = new genus only)
 (H = holotype, A = allotype, P = paratype)

- Alabama
Phytocoris brevisculus
 Alaska
Leptopterna ferrugata
Pinalitus approximatus
Teratocoris saundersi
 Arizona
Adelphocoris superbus
Argyrocoris seurrilis
Atomoseclis modestus
Atractotomus acaciae
A. albidioxis
A. balli
A. hesperius
**A. nicholi*, HAP
A. reuteri
Bifidungulus puberus
**Bolteria juniperi*, P
Bothynotus barberi
Calocoris fasciiventris
Caulotops agavis
**C. barberi*
Ceratocapsus apicalis
**C. nevadensis*, P
****Chaetoxerocolocoris hirsuta*
Chlamydatus suavis
**Coquillettia ajo*, HP
Creontiades rubrinervis
Cyrtopeltis (Engytatus) modestus
C. (Usingerella) simplex
**Cyrtopeltocoris ajo*, H
**C. arizonae*, HP
**C. barberi*, H
**C. conicatus*, H
**C. huachucae*, H
Dalcapidea albescens
Deracocoris barberi
D. bullatus
D. (Camptobrochis) bakeri
D. manitou
Dichaetocoris spinosus
Dichroscytus barberi
**D. flavivenosus*, HAP
**D. latifrons*, P
**D. minimus*, H
**D. rufivenosus*, P
Dicyphus minimus
**D. stitti*, HAP
**Europiella arizonae*, HAP
**E. balli*
**E. brevicornis*, HAP
E. concinna
E. humeralis
**E. nicholi*, HAP
**E. rufiventris*, HAP
E. sparsa
**E. stitti*, HP
**E. viridiventris*, HAP
Eurychiloptereella barberi
Eustictus hirsutipes
E. morrisoni
E. obscurus
E. productus
E. pusillus
Ganocapsus filiformis
Garganus splendidus
Hadronema uhleri
H. picta

- H. sinuata*
 °*Halticotoma andrei*, H
H. cornifer
H. nicholi
H. valida
Hesperocapsus abroniae
H. anograe
H. demensus
 °*H. stitti*, HAP
Hesperophyllum heidemanni
Ilmacora arizonae
I. nicholi
I. santacatalinae
Labopidea arizonae
L. simplex
Lampethusa anatina
L. nicholi
 °*Largidea arizonae*, H
 °*L. balli*, H
 L. rubida
 °*L. stitti*, H
 °*Lepidopsallus arizonae*, HAP
 °*L. longirostris*, P
 °*L. monticola*, P
 °*L. nicholi*, HAP
 L. ovatus
 °*L. pini*, P
Litomiris punctatus
L. rubicundus
Lopidea scutata
Lopidella flavoscuta
Lygus desertinus
 L. hesperus
 °*Macrolophus mimuli*, HAP
 Macrotylodes apicalis
 °*Megalopsallus marmoratus*, HAP
 Melanotrichus albocostatus
 °*M. azteci*, HAP
 M. chelifer
 M. incurvus
 °*M. malvastri*, P
 M. nicholi
 °*M. stitti*, HAP
 °*Microphylidea prosopidis*, P
 Neurocolpus arizonae
 °*N. chiricahuac*, H
 N. mexicanus
 °*N. montanus*, HAP
 °*N. nicholi*, H
 °*N. obsoletus*, H
 N. simplex
 °*N. stitti*, HAP
 Oncerometopus nicholi
 O. nigriclavus
 Oncotylus guttulatus
 Orthops campestris
 Orthotylus vigilax
 °*Parthenicus boutalouae*, HAP
 °*P. cercocarpi*, HAP
 P. covilleae
 °*P. cowaniae*, HAP
 P. cunctinotus
 °*P. deleticus*, H
 °*P. fuscipilus*, H
 °*P. fuscus*, HAP
 P. irroratus
 P. micans
 °*P. nicholcellus*, HAP
 P. nicholi
 °*P. obsoletus*, HP
 P. orcaides
 P. pallipes, H
 P. picicollis
 P. pictus
 °*P. pinicola*, P
 °*P. rubropunctipes*, HA
 °*P. rufiguttatus*, HAP
 P. ruficenosus
 P. rufusculus
 P. sabulosus
 P. selectus
 °*Phymatopsallus prosopidis*, P
 Phytocoris acaciae
 P. albellus
 P. albidopictus
 °*P. albiceps*
 °*P. albifrons*, H
 °*P. albiscutellatus*, HAP
 P. angustatus
 P. angusticollis
 P. apache
 °*P. brevicornis*, HAP
 P. brevisculus
 P. carnosulus
 °*P. chiricahuac*, HP
 P. comulus
 P. cunctinotus
 P. difformis
 °*P. empyrensis*, HA
 P. cphedrae
 °*P. flaviatus*, H
 P. fraterculus
 P. fuscipennis
 P. heidemanni
 P. hesperius
 P. hopi
 P. interspersus
 P. laevis
 P. longirostris
 P. mellarius
 P. miniatus
 °*P. minucndus*, H
 P. mirus
 P. nicholi
 P. nigripubescens
 P. picicollis
 P. pulchellus
 °*P. quadricinctus*, HAP
 P. ramosus
 °*P. relativus*, HP
 °*P. rinconae*, H
 P. roscipennis
 P. roseotinctus
 P. rubroornatus
 °*P. santaritae*, H
 P. seminotatus
 P. squamosus
 P. stitti
 P. strigosus
 P. tinctus
 °*P. tricinatus*, HAP
 P. umbrus
 P. varius
 P. viridus
 P. yuma
 °*Pilophoropsis balli*, HP
 P. brachypterus
 P. nicholi

- °*Pilophorus barberi*, H
- °*P. chiricahuae*, HP
- P. clavicornis*
- P. crassipes*
- P. exiguus*
- P. fuscipennis*
- °*P. hesperus*, P
- °*P. microsetosus*, P
- P. vicarius*
- °*Pinalitus rubrotinctus*, HAP
- °*P. utahensis*, HAP
- Platylygus vanduzeei*
- Polymerus diffusus*
- Prepops atripennis*
- P. rubroscutellatus*
- P. rubrovittatus*
- Pseudatomoscelis seriatus*
- Pseudopsallus angularis*
- Pycnoderes atratus*
- P. quadrimaculatus*
- Ranzovius moerens*
- Reuteroscopus dreisbachi*
- Semium subglaber*
- °*Sericophanes fuscicornis*, HP
- S. triangularis*
- °*Sixeonotus bebbiae*, HAP
- S. dextratus*
- S. insignis*
- S. nicholi*
- °*Squamocoris arizonae*, HP
- Stittocapsus franseriae*
- Taedia parenthesis*
- T. virgulatus*
- Tripidosteptes vittifrons*

Arkansas

Labopidea allii

California

- Adelphocoris superbus*
- Atomoscelis modestus*
- Atractotomus hesperius*
- A. reuteri*
- Bolteria speciosa*
- Capsus ater*
- Ceratocapsus fusiformis*
- °°°*Chaetophyllidea moerens*
- Chlamydatus monilipes*
- C. suavis*
- Clivinema sulcata*
- Closterocoris amoenus*
- Crcontiades femoralis*
- Criocoris saliens*
- Cyphopelta modesta*
- Cyrtopeltis (Engytatus) modestus*
- C. (Usingerella) simplex*
- Dacerla inflata*
- Daleapidea albescentis*
- °°*D. daleae*, P
- Deracocoris californicus*
- D. (Camptobrochis) bakeri*
- D. (Camptobrochis) brevis*
- D. (Camptobrochis) luridipes*
- D. (Camptobrochis) validus*
- D. cerachates*
- D. convexulus*
- D. fulgidus*
- Dichroscytus suspectus*
- °*D. vittatipennis*, H
- D. vittatus*

- Dicyphus californicus*
- D. crudus*
- °*D. diplaci*, HAP
- D. elongatus*
- D. hesperus*
- °*D. paddocki*, HA
- °*D. phacelliae*, H
- D. rivalis*
- D. rufescens*
- D. usingeri*
- Ectopiocerus anthracinus*
- Europicella concinna*
- E. decolor*
- E. sparsa*
- Hadronema uhleri*
- Halticotoma valida*
- Hesperocapsus tanneri*, A
- Hoplomachus affiguratus*
- Irbisia brachycera*
- I. pacifica*
- Labopidea arizonae*
- L. atriseta*
- L. nigripes*
- Largidea grossa*
- L. pucida*
- °*Lepidopsallus californicus*, HAP
- °*L. hesperus*, P
- L. ovatus*
- L. rubidus*
- Litomiris gracilis*
- Lygus desertinus*
- Macrotyloides apicalis*
- M. vestitus*
- Macrotylus infuscatus*
- Lygidea annexa*
- L. morio*
- Melanotrichus coagulatus*
- M. ferox*
- °*M. malvastri*, HAP
- M. tibialis*
- Neurocolpus simplex*
- Notholopus californicus*
- Oncerometopus californicus*
- O. nigriclavus*
- Oncotylus guttulatus*
- Orthops campestris*
- Orthotylus vigilax*
- Pamillia behrensii*
- Parthenicus brunneus*
- P. candidus*
- P. covilleae*
- P. discalis*
- P. femoratus*
- P. grex*
- °*P. muchmori*, H
- P. mundus*
- P. pallidicollis*
- P. picicollis*
- P. ruber*
- P. soror*
- Phytocoris albicollis*
- °*P. albiceps*
- P. albidopictus*
- P. bakeri*
- °*P. californicus*, H
- P. calvus*
- P. candidus*
- P. canescens*
- P. consors*

P. cuncalis
P. commissuralis
P. formosus
P. fraterculus
P. geniculatus
P. hirtus
P. histriculus
P. ingens
P. interspersus
P. jucundus
P. nigrifrons
P. maritimus
P. plenus
P. ramosus
P. roseus
P. rufoscriptus
P. squamosus
P. stellatus
P. sonorensis
P. tenuis
P. tinctus
P. vau
P. ventralis
P. vinaceus
P. vividus
Pilophorus discretus
P. tibialis
P. tomentosus
P. schwarzii
 ° *Pinalitus californicus*, H
P. solivagus
Platylygus vanduzeei
Poecilocapsus nigriger
Polymerus diffusus
Prepops bivittis
Pseudatomoscelis seriatus
Pseudopsallus angularis
Pycnocoris ursinus
Pycnoderes atratus
Ranzovius moerens
Spanagonicus alhofaciatus
Slaterocoris croceipes
 ° *Sericophanes rubripes*, H
 ° *S. tumidifrons*, H
Teleorhinus cyaneus
 ° *T. nigricornis*, P
Tropidosteptes illitus

California (Baja)

Dicyphus disclusus
Europiella humeralis
Macrolophus lopezi
Megalopsallus nuperus
Parthenicus covilleae
Phytocoris lenis
P. loretoensis
Pseudopsallus angularis

Colorado

Adelphocoris superbus
Argyrocoris scurrielis
Atomoscelis modestus
Atractotomus cercocarpi
A. hesperius
Bifidungulus puberus
Calocoris fasciaticentris
Campylomma verbaei
Ceratocapsus apicalis
C. fusiformis
 ° *Cyrtopeltocoris balli*, HAP

Deracocoris (Camptobrochis) bakeri
D. (Camptobrochis) brevis
D. harberi
D. fulgidus
D. manitou
 ° *Dichaetocoris coloradensis*, HAP
D. spinosus
 ° *Dichrooscytus angustifrons*, HAP
 ° *D. cuneatus*, HP
 ° *D. flavivenosus*, P
 ° *D. fuscicornis*, HAP
 ° *D. latifrons*, HA
 ° *D. nitidus*, HAP
D. irroratus
 ° *D. ruberellus*, HAP
 ° *D. rufivenosus*, HAP
D. suspectus
Dicyphus agilis
D. hesperus
Europiella angulata
E. decolor
E. sparsa
E. stigmata
 ° *E. yampae*, HAP
Eustictus pusillus
Hadronema picta
H. uhleri
Halticotoma valida
Halticus intermedius
Hesperocapsus abroniae
H. anograc
 ° ° *H. artemisicola*
H. demensus
 ° *H. gaurae*, P
H. sericatus
H. tanneri
Hoplomachus affiguratus
Horcias dislocatus
H. sexmaculatus
Ilacora albifrons
Ilacorella nigrisquamata
I. sulcata
Irbisia brachycera
Labopidea chloriza
L. nigripes
L. simplex
Labops hesperius
L. hirtus
 ° *Largidea gerhardi*, H
L. rubida
 ° *L. shoshonea*, H
 ° *Lepidopsallus longirostris*, HAP
 ° *L. monticola*, HAP
L. rubidus
 ° *L. pini*, HAP
 ° *L. tuthilli*, H
Leptopterna dolabrata
L. ferrugata
Litomiris debilis
L. rubicundus
Lygidea annexa
Lygus desertinus
Macrotyloides vestitus
Megalopsallus latifrons
M. rubropictipes
Melanotrichus albocostatus
M. althacae
M. chelifer
M. coagulatus

M. incurvus
M. viridicatus
Mimoceps insignis
Monosynamma bohemani
Neurocolpus nubilus
Noctuocoris fumidus
Oncerometopus nicholi
O. nigriclavus
Oncotylus guttulatus
Orcetoderus longicollis
Orthops campestris
Orthotylus angulatus
O. (Neomecomma) candidatus
O. fuscicornis
O. picicola
O. ute
Parthenicus oreades
 **P. ribesi*, HAP
 **P. pinicola*, HAP
 **Phylloidea montana*, HAP
Phytocoris cercocarp
P. comulus
P. conspurcatus
P. heidemanni
P. hesperius
P. hopi
P. interspersus
P. laevis
P. mirus
P. picicola
P. simulatus
P. stellatus
P. umbrosus
P. validus
P. varius
 **Pilophorus balli*, HAP
P. crassipes
 **P. diffusus*, HAP
 **P. dislocatus*, HAP
P. fuscipennis
 **P. hesperus*, HAP
 **P. jezzardi*, HAP
 **P. longisetosus*, H
 **P. microsetosus*, P
P. opacus
 **P. salicis*, HAP
 **P. utahensis*, P
P. vicarius
Pinalitus approximatus
 **P. breviostris*, HAP
Platyhygus vanduzeei
Polymerus diffusus
Porpomiris curtulus
Prepops bivittis
P. rubroscutellatus
Pseudatomoscelis seriatus
Sericophanes triangularis
Sixemotus insignis
Slaterocoris croceipes
S. robustus
 **S. utahensis*, P
Stenodema virens
Stenotus binotatus
Teratocoris discolor
T. saundersi

Florida

Creontiades debilis
C. rubrinervis

Cyrtopeltis (Engytatus) modestus
Dicyphus minimus
Pseudatomoscelis seriatus
Ranzovius moerens
Spanagonicus albofasciatus

Georgia

Creontiades debilis

Idaho

Adelphocoris superbus
Atomoscelis modestus
Atractotomus purshiae
Campylomma verrhasei
Capsus ater
Criocoris saliens
Dichroscytus irroratus
Dicyphus hesperus
Hadronema uhleri
H. uniformis
Hoplomachus affiguratus
Ilmacorella argentata
I. sulcata
Irbisia brachyccra
I. elongata
I. nigripes
I. pacifica
I. shulli
 **Labopidea idahoensis*, H
L. nigrisetosa
Labops hesperius
L. hirtus
 **Lepidopsallus hesperus*, HAP
L. rubidus
Leptopterna ferrugata
Litomiris curtus
L. debilis
Lygus desertinus
L. elisus
L. hesperus
Macrotyloides vestitus
Megaloceraca recticornis
Melanotrachus albocostatus
 **M. brindleyi*, A
M. coagulatus
M. mistus
 **M. shoshonea*, P
M. viridicatus
Mimoceps insignis
 **Neurocolpus longirostris*
Orthops campestris
Orthotylus ute
 **Parthenicus brindleyi*, HAP
 **Phylloidea montana*, P
Phytocoris interspersus
Pinalitus approximatus
Polymerus diffusus
Prepops bivittis
 **Slaterocoris utahensis*, P
 **Squamocoris utahensis*, P
Stenodema virens
Stenotus binotatus
 **Teleorhinus brindleyi*, HP

Illinois

Criocoris saliens
Labopidea allii
Monosynamma bohemani
Neurocolpus jessiae
N. rubidus

- Pseudatomoscelis seriatus*
Teratocoris discolor
- Iowa
Criocoris saliens
Hesperophyllum heidemanni
Labopidea allii
Litomiris debilis
Melanotrichus althaeae
M. incurvus
Monosynamma bohemani
Neurocolpus jessiae
N. tiliac
Teratocoris discolor
- Kansas
Adelphocoris superbus
Criocoris saliens
Hadronema picta
 •••*Hesperocapsus artemisicola*
Labopidea allii
Neurocolpus rubidus
N. tiliac
Phytocoris conspurcatus
- Kentucky
Pseudatomoscelis seriatus
- Maryland
Neurocolpus rubidus
Porpomiris curtulus
- Michigan
Melanotrichus althaeae
Neurocolpus rubidus
- Minnesota
Criocoris saliens
Leptopterna ferrugata
Melanotrichus althaeae
 •*M. brindleyi*, P
Neurocolpus tiliac
Orthotylus (Neomecomma) candidatus
Pseudatomoscelis seriatus
Teratocoris discolor
- Mississippi
Creontiades debilis
Cyrtopeltis (Engytatus) modestus
Neurocolpus jessiae
- Missouri
Ceratocapsus apicalis
Labopidea allii
Neurocolpus jessiae
Spanagonicus albofasciatus
- Montana
Atractotomus hesperius
Capsus ater
Deracocoris barberi
 •*Europiella montanae*, HAP
Hesperocapsus tanneri
Ilmacorella argentata
Irbisia brachycera
I. nigripes
I. pacifica
Labopidea simplex
L. viridula
Labops hesperius
L. hirtus
 •*Largidea shoshonea*, P
- Leptopterna ferrugata*
Litomiris curtus
L. debilis
Mimoceps insignis
 •*Neurocolpus longirostris*
Orthotylus ute
Prepops bivittis
Stenodema cirens
- Nebraska
Criocoris saliens
Irbisia brachycera
Phytocoris comulus
Porpomiris curtulus
Pseudatomoscelis seriatus
- Nevada (not including Nevada Test Site)
Adelphocoris superbus
 ••*Ceratopidea daleae*, P
 •*Ceratocapsus nigrocuneatus*, P
Clivinema medialis
Deracocoris (Camptobrochis) bakeri
D. brevis
D. fulgidus
Europiella concinna
E. decolor
E. stigmata
Hadronema picta
H. uniformis
 •*Hesperocapsus utahensis*, P
Irbisia pacifica
Labopidea nigripes
Labops hirtus
Lopidea knoxtoni
Leptopterna ferrugata
Litomiris debilis
Lygus desertinus
Megalopsallus rubropictipes
Melanotrichus coagulatus
M. tibialis
Oncerometopus nigriclavus
Parthenicus corilleae
Phytocoris albidopictus
 •*P. albidosquamus*, P
P. consors
P. nigripubescentis
P. politus
 •*P. rostratus*, P
P. squamosus
 •*P. tricinctipes*, AP
P. vividus
 •*Pilophorus microsctosus*, P
 •*P. nevadensis*, HAP
Platylygus vanduzeei
Polymerus diffusus
P. relativus
Prepops atripennis
P. bivittis
 •*Psallus merinoi*
Pseudopsallus angularis
Slatrococoris robustus
 ••*Squamocoris utahensis*, P
Teratocoris discolor
Tropidosteptes vittifrons
- Nevada Test Site
 ••*Ankylostylus pallipes*, HAP
Atomoscelis modestus
Atractotomus purshiae
 ••*Beckocoris laticephalus*, HAP

- Bifidungulus puberus*
 °*Bolteria juniperi*, P
 B. speciosa
 °°*Brachyccratocoris nevadensis*, HAP
 Ceratocapsus fusiformis
 °*C. nevadensis*, HAP
 °*C. nigrocuneatus*, H
 °°*Ceratopidea daleae*, HAP
 Chlamydatus associatus
 °*C. becki*, P
 C. monilipes
 °*Coquillettia albella*, HAP
 °*C. luteiclava*, HAP
 °*C. virescens*, H
 Daleapidea albescentis
 °°*D. daleae*, HAP
 Deracocoris (Camptobrochis) bakeri
 D. brevis
 D. bullatus
 D. schwarzii
 °*Dichaetocoris brevirostris*, H
 °*D. juniperi*, HAP
 °*D. mcrinoi*, HAP
 °*D. nevadensis*, HAP
 D. peregrinus
 °*D. pinicola*, HAP
 °*D. stanleyana*, HAP
 °*D. symphoricarpi*, HAP
 °*Dichrooscytus apicalis*, H
 °*D. flavicinctus*, P
 °*D. junipericola*, HP
 °*D. pinicola*, HP
 D. irroratus
 Dicyphus hesperus
 °*D. ribesi*, HAP
 °*Europiclla albipubescentis*, HAP
 E. decolor
 °*E. grayiac*, HAP
 °*E. lycii*, HAP
 °*E. nigrofemoratus*, HP
 °*E. nigricornis*, HAP
 °*E. punctipes*, HAP
 E. sparsa
 E. stigmosa
 °*E. unipuncta*, HAP
 Hadronema picta
 H. uhleri
 Hesperocapsus darisi
 °*H. plagiatus*, HAP
 Hoplomachidea consors
 °*Largidea nevadensis*, HAP
 Larinocerus balius
 °*Lepidopsallus pini*, P
 °*Lopidea becki*, HAP
 °*L. deserti*, HAP
 °*L. fuscata*, HAP
 L. knowltoni
 L. scutata
 Lygus desertinus
 L. elisus
 L. hesperus
 Macrotylus infuscatus
 °*M. salviac*, HAP
 Melanotrichus albocostatus
 °*M. atriplicis*, HP
 M. chelifer
 M. coagulatus
 °*M. curotiac*, HAP
 °*M. nevadensis*, HAP
 °*M. pallens*, HAP
 °°*Mcrinocapsus ephedrae*, HAP
 °*Microphyllellus symphoricarpi*, HAP
 °*Microphylidea pallens*, H
 °*M. prosopidis*, HAP
 °°*Nevadocoris becki*, HAP
 °*N. bullatus*, HAP
 °*N. pallidus*, HAP
 Oncotylus guttulatus
 °*Parthenicus accumulus*, HP
 °*P. atriplicis*, HAP
 °*P. becki*, HAP
 °*P. brevicornis*, HP
 °*P. condensus*, H
 P. covilleae
 P. cuneotinctus
 °*P. desertus*, H
 °*P. furcatus*, HP
 °*P. incurvus*, HP
 °*P. mcrinoi*, HP
 °*P. miniopunctatus*, H
 °*P. nevadensis*, H
 °*P. nigripunctus*, HP
 P. pictus
 °*P. pilipes*, HP
 °*P. pinicola*, P
 °*P. rubrosignatus*, H
 P. rufusculus
 P. sabulosus
 °*P. trispinosus*, H
 °*P. utahensis*, P
 Phyllopictea hirta
 P. picta
 °*Phymatopsallus prosopidis*, HAP
 °*P. ribesi*, HAP
 Phytocoris albidopictus
 °*P. albidosquamus*, HP
 °*P. albiscutellatus*, P
 °*P. becki*, HAP
 °*P. breviatus*, HAP
 P. carnosulus
 P. consors
 °*P. contrastus*, HAP
 P. cuneotinctus
 °*P. decurratus*, H
 °*P. deserticola*, HAP
 P. ephedrae
 °*P. flavellus*, HAP
 P. geniculatus
 °*P. gracillatus*, HA
 °*P. hesperellus*, A
 °*P. hirsuticus*, HP
 °*P. juniperanus*, HP
 °*P. lineatellus*, HAP
 °*P. longihirtus*, HA
 P. mellarius
 °*P. mcrinoi*, HAP
 °*P. minutuberculatus*, H
 P. nigripubescentis
 °*P. nigrolineatus*, HAP
 P. plenus
 P. pulchellus
 P. ramosus
 °*P. reticulatus*, HAP
 °*P. rostratus*, HAP
 P. squamosus
 °*P. tricornitipes*, HP
 °*P. ventralis*
 P. vividus

°*Pilophorus merinoi*, HP
 °*P. microsetosus*, HAP
 °*Plagiognathus salviae*, HAP
Platyligys vanduzeei
Polymerus relaticus
 °*Psallus atriplicis*, HAP
 °*P. purshiae*, HAP
Pseudatomoscelis seriatus
Rhinacloa forticornis
Semium subglaber
 °*Sericophanes nevadensis*, HP
Slaterocoris croceipes
 °*S. longipennis*, HAP
 °*S. rubrofemoratus*, HAP
Spanagonicus albofasciatus
Stenodema circens
Stittocapsus franseriae
Trigonotylus americanus

New Hampshire

Hesperophylum heidemanni

New Jersey

Porpomiris curtulus
Pseudatomoscelis seriatus
Spanagonicus albofasciatus

New Mexico

Adelphocoris superbus
Argyrocoris scurrilis
Atomoscelis modestus
Atractotomus cercocarpi
A. reuteri
Ceratocapsus apicalis
Clivinema serica
Deracocoris barberi
D. manitou
Dichrooscytus elegans
D. irroratus
 °*D. rugosus*, P
Eustictus obscurus
Hadronema picta
H. sinuata
Halticus intermedius
Labopella claripennis
Labopidea chloriza
L. simplex
Largidea rubida
Leptopterna dolabrata
Litomiris rubicundus
Melanotrichus chclifer
M. coagulatus
M. incurvus
Mimoceps insignis
Neurocolpus arizonae
N. nubilus
Onceronotopus nigriclavus
Parthenicus aridus
Phytocoris acaciae
P. albidipictus
P. apache
P. comulus
P. heidemanni
P. hesperius
P. hopi
P. interspersus
P. lucis
 °*P. mesillae*, HP
P. roseotinctus

P. simulatus
P. strigosus
P. umbrosus
P. vanduzeei
Platyligys vanduzeei
Polymerus diffusus
Prepops rubroscutellatus
 °*Teleorhinus utahensis*, P
Sericophanes triangularis

New York

Dichrooscytus rufipennis
 °*Dicyphus rubi*, HAP
Labops hirtus
Monosynamma bohemani
Neurocolpus jessiae
N. rubidus
Pinalitus approximatus
Porpomiris curtulus

North Carolina

Pseudatomoscelis seriatus

North Dakota

Irbisia brachycera
Phytocoris conspurcatus
Sericophanes triangularis

Ohio

Neurocolpus rubidus

Oklahoma

Atomoscelis modestus
 °*Cyrtopeltocoris oklahomae*, H
Halticotoma valida
Horcias sexmaculatus
Labopidea allii
Onceronotopus nigriclavus
Sericophanes triangularis

Oregon

Campylomma verbasci
Capsus ater
Deracocoris (Camptobrochis) validus
Dicyphus rivalis
 °*Europiclla rubricornis*, AP
Hadronema uniformis
Ibnacora albifrons
Ibnacorella argentata
Irbisia shulli
Labopidea atriseta
L. nigripes
L. nigriscitosa
Labops hesperius
L. hirtus
Largidea grossa
L. pucida
Leptopterna ferrugata
Lygus desertinus
Megaloceraca recticornis
Monosynamma bohemani
Orectoderus schuhi
Phytocoris fuscognatus
P. hesperius
P. rolfsi
Pilophorus tibialis
Pitbanus mackeli
Polymerus diffusus
Stenotus binotatus
 °*Teleorhinus oregoni*, HP

South Dakota

Atomoscelis modestus
Ceratocapsus apicalis
 ° *Hesperocapsus gaurae*, HAP
Litomiris curtus
L. debilis
 ° *Melanotrichus custeri*, HAP
 ° *M. uniformis*, P
Phytocoris conspurcatus
P. lacvis
P. validus
Sericophanes triangularis
Teratocoris discolor

Texas

Adelphocoris superbus
Argyrocoris scurrilis
Atomoscelis modestus
Beamerella personatus
 °°° *Chaetofoveolocatoris hirsuta*
Creontiades debilis
C. rubrinervis
Criocoris saliens
Cyrtopeltis (Engytatus) modestus
Cyrtopeltocoris alhofasciatus
Dichrooscytus irroratus
Dicyphus minimus
Eustictus pusillus
Halticotoma valida
Horcias dislocatus
H. sexmaculatus
Labopella claripennis
Lampethusa anatina
L. nicholi
Lepidopsallus rubidus
Litomiris rubicundus
Neurocolpus arizonae
N. jessiae
N. jolinstoni
N. mexicanus
N. nubilus
N. rubidus
N. tiliac
Oncerometopus nigriclavus
Parthenicus covilleae
Phytocoris acaciae
P. breviusculus
P. carnosulus
P. ephedrae
 ° *P. quadricinctus*, P
Prepops rubrovittatus
Pseudatomoscelis seriatus
Pycnoderes atratus
Ranzovius moerens
Schaffneria schaffneri
Sericophanes triangularis
Sixconotus insignis

Utah

Adelphocoris superbus
Argyrocoris scurrilis
Atomoscelis modestus
 ° *Bolteria juniperi*, HAP
 ° *Chlamydatus becki*, HAP
C. uniformis
C. suavis
Clivinema medialis
C. scriba
Deracocoris (Camptobrochis) bakeri
D. brevis

D. schwarzii
 ° *Dichaeocoris minimus*, H
 ° *D. pinicola*, P
 ° *D. utahensis*, HAP
Dichrooscytus irroratus
 ° *D. rufivenosus*, P
 ° *D. rugosus*, HP
 ° *D. utahensis*, HP
Dicyphus hesperus
Europiella angulata
E. decolor
E. pilosula
 ° *E. rubricornis*, H
E. sparsa
E. stigmosa
 ° *E. unipuncta*, P
Hadronema sinuata
H. uhleri
Halticotoma valida
Hesperocapsus davisi
H. tanncri
 ° *H. utahensis*, H
Ilmacorella argentata
Irbisia brachycera
I. pacifica
I. shulli
Labopidea chloriza
L. simplex
 ° *L. utahensis*, H
L. viridula
Labops utahensis
Lepidopsallus rubidus
Leptopterna ferrugata
Lopidea scutata
Lygus desertinus
Megalopsallus latifrons
M. rubropictipes
Melanotrichus albocostatus
M. brevisrostris
M. coagulatus
 ° *M. custeri*, P
M. inconspicuus
 ° *M. uniformis*, HAP
 ° *M. utahensis*, HAP
M. viridicatus
M. wileyae
 ° *Microphylidea prosopidis*, P
Mimocaps insignis
Neurocolpus arizonae
Noctuocoris fumidus
Orthops campestris
Orthotylus angulatus
O. (Neomaccommma) candidatus
O. fuscicornis
 ° *Parthenicus basicornis*, H
 ° *P. conspersus*, HAP
P. cuneotinctus
 ° *P. davisi*, HP
P. multipunctatus, H
P. sabulosus
P. soror
 ° *P. tenuis*, HP
 ° *P. utahensis*, H
Phylloidea picta
 ° *P. utahensis*, HAP
Phytocoris calhi
P. cuneotinctus
P. interspersus
 ° *P. gracillatus*, P

- P. hesperellus*, H
- P. laevis*
- P. laticeps*, H
- P. miniatus*
- P. nigripubescent*
- P. quadriannulipes*, HP
- P. ramosus*
- P. relativus*, AP
- P. subcinctus*, HP
- P. sublineatus*, HP
- P. tanneri*, HP
- P. utahensis*
- Pilophorus hesperus*, P
- P. tanneri*, HA
- P. utahensis*, HAP
- Pinalitus utahensis*, P
- Platylygus vanduzeei*
- Polymerus diffusus*
- P. relativus*
- Porpomiris curtulus*
- Prepops atripennis*
- P. bivittis*
- Pseudatomoscelis seriatus*
- Sericophanes triangularis*
- Slateocoris croceipes*
- S. robustus*
- S. rubrofemoratus*, P
- S. utahensis*, HA
- Squamocoris utahensis*, H
- Stenodema virens*
- Stenotus binotatus*
- Teleorhinus utahensis*, HA
- Teratocoris discolor*
- Tropidosteptes vittifrons*

Washington

- Atomoscelis modestus*
- Campylomma verbasco*
- Capsus ater*
- Criocoris saliens*
- Dichroscytus adamsi*, HAP
- D. rainieri*, HAP
- Dicyphus, brachypterus*
- D. elongatus*
- D. pallicornis*
- D. tinctus*
- Hadronema uhleri*
- Halticotoma brunnea*, H
- Hoplomachus affiguratus*
- Ilacora albifrons*
- Irbisia elongata*
- I. pacifica*
- I. shulli*
- Labopidea nigriseta*
- Labops hesperius*
- L. hirtus*
- Largidea grossa*
- Lepidopsallus rubidus*
- Lygus desertinus*
- Leptopterna ferrugata*
- Melanotrichus albocostatus*
- M. mistus*
- Megaloceraea recticornis*
- Monosynamma bohemanii*
- Neurocolpus longirostris*
- Orectoderus arcuatus*
- Phytocoris gracillatus*, P
- P. rolfsi*
- Pinalitus approximatus*

- Pithamus maerkeli*
- Polymerus diffusus*
- Stenotus binotatus*
- Teleorhinus nigricornis*, HA

Washington, D. C.

- Hesperophylum heidemannii*

Wisconsin

- Neurocolpus jessiae*

Wyoming

- Adelphocoris superbus*
- Atractotomus hesperius*
- Capsus ater*
- Dichroscytus convexifrons*, HAP
- D. deleticus*, HP
- D. flavescens*, HAP
- D. irroratus*
- D. suspectus*
- Dicyphus hesperus*
- Europiella pilosula*
- Hesperocapsus gaurae*, P
- Hoplomachus affiguratus*
- Ilacorella nigrisquamosa*
- I. sulcata*
- Irbisia brachycera*
- I. elongata*
- Labopidea nigriseta*
- L. simplex*
- Labops hesperius*
- L. hirtus*
- Largidea shoshonae*, A
- Lepidopsallus hesperus*, P
- L. longirostris*, P
- Litomiris curtus*
- L. debilis*
- Lygus desertinus*
- Melanotrichus brindleyi*, HP
- M. coagulatus*
- M. incurvus*
- M. shoshonae*, HAP
- M. viridicatus*
- Mimocapsus insignis*
- Neurocolpus longirostris*
- Orthotylus ute*
- Phylloidea montana*, P
- Phytocoris hesperius*
- Pilophorus diffusus*, P
- P. hesperus*, P
- P. microsetosus*, P
- Prepops bivittis*
- Teleorhinus brindleyi*, P
- Teratocoris saundersi*

Foreign Countries

Alberta (Canada)

- Capsus ater*
- Hoplomachus affiguratus*
- Ilacorella sulcata*
- Irbisia nigripes*
- Labops hesperius*
- L. hirtus*
- Melanotrichus mistus*
- Phytocoris laevis*

British Columbia (Canada)

- Campylomma verbasco*
- Dicyphus elongatus*
- D. pallicornis*

Labops hirtus
Labopidea nigripes
L. nigrisetosa
Megaloceraca recticornis
Melanotrichus albocostatus
M. atricornis
Monosynamma bohemani
Phytocoris interspersus
Pinalitus approximatus
Pithanus macrkeli
Polymerus diffusus
Prepops bivittis

Finland

Teratocoris saundersi

Manitoba (Canada)

Teratocoris saundersi

Mexico

Crcontiades rubrinervis
Cyrtopeltis (Engytatus) modestus
Neurocolpus mexicanus
Prepops bivittis
Pycnoderes atratus
Ranzovius mocrens

Puerto Rico

Cyrtopeltis (Engytatus) modestus

Venezuela

Ranzovius mocrens

S-NA-P[rovo]

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Science Bulletin**

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**OSTEOLOGY AND MYOLOGY OF
PHRYNOSOMA P. PLATYRHINOS GIRARD
AND PHRYNOSOMA D. HERNANDESI GIRARD**

by

Richard L. Jenkins

and

Wilmer W. Tanner



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Science Bulletin**

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OSTEOLOGY AND MYOLOGY OF
PHRYNOSOMA P. PLATYRHINOS GIRARD
AND PHRYNOSOMA D. HERNANDESI GIRARD

by

Richard L. Jenkins and Wilmer W. Tanner

INTRODUCTION

Phrynosoma Wiegmann (horned lizard) is a peculiar North American genus of the family Iguanidae inhabiting the central and western United States and northern and central Mexico.

The osteology of *Phrynosoma* has not been adequately worked out and described, but has been dealt with in varying degrees by many authors. Cope (1892) gives a general account of the osteology of *Phrynosoma douglassi*, *Phrynosoma cornutum* and *Phrynosoma coronatum*. The same account was incorporated into Cope's *Crocodylians, Lizards and Snakes* (1900) and supplemented with some measurements, external morphological illustrations, and brief descriptions of other members of the genus.

Bryant (1911) gives the general osteology of *Phrynosoma*, which is an amplification of Cope's account (1900), illustrates the pelvic girdles of *Phrynosoma b. blainvillii* and *Phrynosoma* (*Anota*) *m'callii*, and sterna and dorsal views of the skull of *Phrynosoma d. douglassi*, *Phrynosoma b. blainvillii*, *Phrynosoma platyrhinos* and *Phrynosoma m'callii* and discusses the external characteristics and general osteology of all species considered by him.

Broom (1948) gives general notes on a skull, which he believed to be *Phrynosoma cornutum*, and illustrates the dorsal, occiput and temporal regions of the skull as well as the inner side of the right mandible. From a single skull of *Phrynosoma cornutum* prepared by us, it is difficult to definitely verify Broom's illustrations and to associate them with *Phrynosoma cornutum*.

Detrie (1950) illustrates and describes the osteology of the skull of *Phrynosoma cornutum*. His illustrations of dorsal, ventral, lateral, and posterior views of the skull are probably the best in the available literature on *Phrynosoma*.

Reeve (1952) uses the material published by Cope (1900), Bryant (1911) and Broom (1948), in providing a descriptive osteology of *Phrynosoma* based mainly upon *Phrynosoma cornu-*

tum and includes unlabelled photographs of dorsal views of *Phrynosoma m'callii*, *modestum*, *solare*, *platyrhinos*, *douglassi ornatissimum*, *orbiculare cortezii*, *cornutum*, and *coronatum blainvillii*. The photographs lack detail, but are excellent for observing the outline and general shape of the dorsal aspect of the skull.

Etheridge (1964) characterizes the skeletal morphology and systematic relationships of sceloporine lizards and portrays the peculiarity of *Phrynosoma* from all other iguanids as being its short, wide, flattened body, short tail, and large head spines (excluding *Phrynosoma dimarsi* which does not possess the latter). He lists the head ornamentation reflected in the configuration of skull bones as osteological peculiarities of the genus. These included: the presence or absence of tuberosities, spines or horns on the dentary, prearticular, supra-angular, parietal, frontal, postorbital, jugal and squamosal; the absence of lacrimal and postfrontal; formation of a supra-orbital arch; the restricted size of the suborbital vacuities and supratemporal fenestrae or entire closing of the latter; maxilla separated from the nasals by the prefrontals or in contact with the nasals; posterolateral projections of the diapophyses of the second sacral vertebrae usually lacking; caudal vertebrae all nonautotomic and usually less than 20; Meckel's groove usually open and splenial extending almost to mental symphysis; retroarticular process vertically flattened or absent; median process of the interclavicle extremely short; scapular ray short or absent; clavicles lacking hooklike processes; sternum short and broad across its base; sternal fontanelle extending well forward of the widest part of the sternum; usually 2 sternal ribs, occasionally 1 or 3. (the number may be variable on each side); widely separated xiphisternal rods usually lacking rib connections; 7-9 post-sternal dorsal ribs as long as the sternal ribs, each bearing a short costal cartilage; incipient zygosphenes and zygantra present, being best developed in the caudal vertebrae.

Etheridge (*op. cit.*) lists other skeletal features which *Phrynosoma* has in common not only with sceloporines but also with other iguanids and lists external differences between *Phrynosoma* and the sceloporines.

Myological studies on *Phrynosoma* are not extensive and those available are limited in scope. Sanders (1874), in his notes on the myology of *Phrynosoma coronatum*, provides the most extensive myological work on *Phrynosoma*. He describes the myological arrangement and illustrates the superficial musculature, musculature of the inner arm and arrangement of the tendons surrounding the knee. He also used an older terminology than is now in use, and did his work probably from a single specimen as he mentions "my specimen" in the beginning of his paper.

Camp (1923) illustrates a ventral view of the head and neck myology of what he terms *Phrynosoma hernandesi*.

Norris and Lowe (1951) indicate the systematic status of *Phrynosoma m'callii*, and make a very restricted study of the osteology and myology confining their study mainly to the temporal and neck regions.

There is much disagreement concerning the phylogenetic status of the genus *Phrynosoma* within the family Iguanidae. Mittleman (1942) distinguishes *Phrynosoma* as "a primitive but highly specialized genus," and illustrates the genus as a very early branch from the *Sceloporus* protostock. Savage (1958) includes *Phrynosoma* in the "sceloporines" based on the verte-

brae characteristics and nasal structure, and indicates *Phrynosoma* to be a highly specialized genus. Etheridge (1964) removes *Phrynosoma* from the sceloporines and states: "The only osteological characteristic common to *Phrynosoma* and the sceloporines, but absent in all other mainland iguanids north of Panama, is the presence of a large sternal fontanelle; it is very small or absent in the others." Although Etheridge suggests that *Phrynosoma* is more closely related to the sceloporines than to other iguanids, he states: "*Phrynosoma* is extremely odd and differs . . . from all other iguanids."

Our study is one in a series of comparative studies and deals with the anterior osteology and myology of *Phrynosoma* and other closely related iguanid genera. Its purpose is to present illustrations and descriptions of the anterior osteology and myology of *Phrynosoma platyrhinos platyrhinos* Girard and the osteology of the skull of *Phrynosoma douglassi hernandesi* Girard, which may be used as a basis for future comparative studies of *Phrynosoma* and other genera considered to be closely related to *Phrynosoma*. Where possible we compare and draw conclusions concerning the osteology and myology of these species.

Appreciation is extended to Drs. Richard Etheridge and Hobart M. Smith who reviewed this paper prior to publication and to Dr. James Peters of the United States National Museum for the loan of the specimens of *Phrynosoma ditmarsii* and to Mr. David F. Avery for permitting the loan of iguanid skulls.

MATERIALS AND METHODS

The principal species used for this study are *Phrynosoma platyrhinos platyrhinos* Girard and *Phrynosoma douglassi hernandesi* Girard.

Skulls and skeletons were prepared by soaking fresh and preserved, skinned specimens in 50 percent ammonium hydroxide for 12 hours with subsequent boiling for 5-30 minutes. They were then picked clean with forceps. Both articulated and disarticulated skeletons were prepared; however, osteological descriptions refer to an articulated structure in this study.

Some experimental, skinned specimens were soaked in full strength and others in dilute clorox bleach for varying lengths of time; however, this method of skeletal preparation was not satisfactory because the small bones and cartilage were destroyed by the clorox.

Fresh and preserved specimens were skinned for myological study. In the anterior gular, ventral, and lateral neck, and lateral abdominal regions, muscle fibers attached to and easily pulled away with the integument were not disregarded.

Skull illustrations were drawn on graph paper directly from observation through the stereoscopic microscope. The myology was studied by describing and illustrating the superficial musculature. These were then dissected away to expose the next layer or deeper muscles. Because the musculature is bilaterally symmetrical, it was possible to show in one illustration two depths of muscles. This not only reduced the number of illustrations but also provided a

comparative relationship between the superficial and deeper muscles.

Measurements of the skull were made in millimeters with calipers. Skull depth was measured from the ventral surface of the occipital condyle to the dorsal surface of the main body of the parietal. Skull length was measured from the posterior surface of the occipital condyle to the most anterior part of the premaxilla. Skull width was designated as the distance between the third temporal spines.

All osteological and myological descriptions and illustrations refer to adult specimens. Specimens prepared for this study (juveniles and adults) are tagged with the following Brigham Young University numbers:

Phrynosoma platyrhinos platyrhinos Girard (27 specimens).

BYU 22825; 22823; 22820; 22827; 22824; 22819; 22813; 22821; 22818; 22816; 22826;

22814; 22833; 22839; 14838; 22830; 22834; 22860; 22840; 22842; 22838; 22841; 22832; 22831; 22823; 23740; 23741.

Phrynosoma douglassi hernandesi Girard (12 specimens).

BYU 22817; 14333; 22828; 22829; 22822; 22815; 1143; 2261; 667; 23808; 23809; 23810.

Specimens prepared for myological purposes were preserved in 10 percent formalin, with some being transferred into 70 percent alcohol. All specimens prepared for this study are accessioned in the herpetological collections of the Natural History Museum of Brigham Young University, Provo, Utah.

Terminology follows primarily that of Robison and Tanner (1962), Avery and Tanner (1964), Reeve (1952), Oelrich (1956) and Etheridge (1964).

OSTEOLOGY OF THE HEAD OF *PHRYNOSOMA P. PLATYRHINOS* AND *PHRYNOSOMA DOUGLASSI HERNANDESI*

The Skull

Premaxilla (Figs. 1 and 3) bears six teeth and is a single bone located at the anterior tip of the upper jaw. A dorsal process forms approximately one-half of the medial border of the fenestra exonarina and terminates as a wedge between the anterior third of the paired nasals. An expansion on each side, located ventral to the mesial part of the ventral border of the fenestra exonarina, extends laterally and lengthens ventrally, forming an oblique articulation with the most anterior extension of the maxilla. A foramen is located on each side of the premaxilla near the angles formed by the dorsal process and lateral expansions.

Nasals (Figs. 1 and 3) are paired structures forming the anterodorsal angle of the skull and located posterodorsally from the posterior edge of the fenestra exonarinae and wedge of the dorsal process of the premaxilla, to the anterior border of the frontal. A small variable, latero-posterior process projects posteriorly from the main body of each nasal in most specimens. The nasal articulates laterally with the prefrontals.

Prefrontals (Figs. 1 and 3) lie lateral to the nasals and form the anterior parts of the orbits and superciliary fossae. Each prefrontal has

three processes. A lateral process extends posteriorly above the anterodorsolateral border of the orbit, thus forming the anterior half of the superciliary bar and making a clear distinction between the orbit and superciliary fossa. A medial process projects posteriorly forming the anteromesial border of the superciliary fossa and articulates mesially with the nasal and anterior frontal. A ventral process, completely forming the lateroanterior border of the orbit, is the most massive of the three processes. It overlays posteriorly and articulates with the dorsal process of the maxilla. Posteromesially the ventral process articulates with the palatine.

Frontal (Fig. 1) is a single bone which forms the posterior halves of the superciliary fossae. The posterior half of the medial border of each fossa is formed by a process which projects anteriorly between the superciliary fossae to the medial processes of the prefrontals and then continues as a broad wedge between the medial processes of the prefrontals to articulate anteriorly with the nasals. Two processes, one on each side, extend laterally, forming the posterior borders of the superciliary fossae. Each process culminates with a lateroanterior extension which forms the posterior part of the superciliary bar. Located at the posterolateral point of each later-

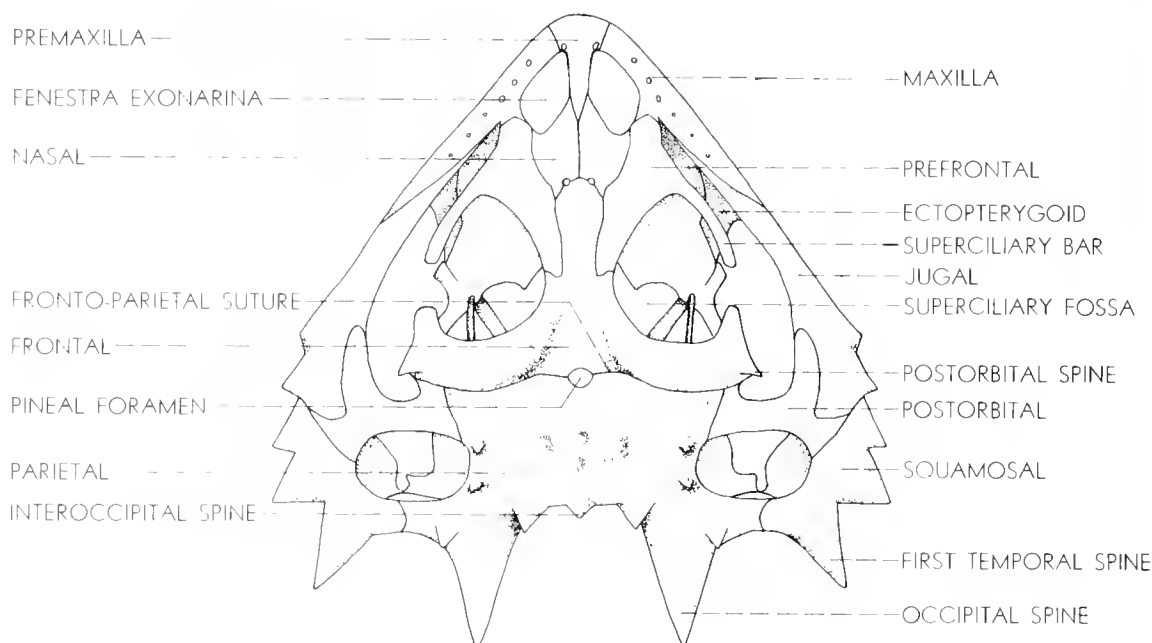


Fig. 1. *Phrynosoma platyrhinos platyrhinos*. Dorsal view of the skull. BYU 22816, 22823. X 4.

al process is a postorbital spine. The posterior border of the frontal articulates with the anterior border of the parietal.

Postorbital (Figs. 1 and 3) separates the orbit and supratemporal fossa. The anterior side forms the posterior border of the orbit and has an anteroventrolaterally projecting process which forms the posterior part of the ventrolateral orbital boundary. The process articulates with the jugal.

In most specimens an expansion of the bone extends posteroventrolaterally to articulate with the squamosal and jugal, and together with the posterior postorbital edge forms the anterior boundary of the supratemporal fossa. This ventroposterior expansion may be variable in size on either side of a single specimen.

Articulation of the postorbital dorsomesially is mainly with the parietal, however, ventral to the postorbital spine a small, extreme dorsal projection articulates at its tip with the frontal. One or more tubercles is usually present on the dorsal surface of the postorbital in adult specimens.

Jugal (Figs. 1 and 3) forms most of the ventrolateral border of the orbit and projects posteriorly forming the anterolateral part of the temporal arch. Anteriorly the jugal becomes slender, overlapping and articulating ventrally with the maxilla to form an oblique suture. In most specimens the oblique suture is curved dorsally making a more slender, anterior projection.

The anterior apex of the jugal terminates within approximately one millimeter of the ventroanterior corner of the orbit. Articulation is also mesially, dorsoposteriorly, and posteriorly with the ectopterygoid, and ventroanterior and ventroposterior processes of the postorbital, and the squamosal respectively.

On the lateral margin of the jugal is a series of spines (usually numbering four in adults) which is a continuation from the squamosal series to approximately the mid-ventrolateral border of the orbit.

Parietal (Fig. 1) is a single structure located posterior to the frontal. The parietal terminates anterolaterally on each side in an inverted V with the pointed apex being slightly ventral and mesial to the postorbital spine. Each V is wedged between and articulates with the laterally projecting process of the frontal and the dorsal postorbital including its small, most dorsal projection. The lateral parietal forms the medial border and approximately one-third of the mesial part of the posterior border of each supratemporal fossa.

Two large spines project posterodorsally from the posterior parietal. Although these spines are formed as a part of the parietal, and could correctly be called parietal spines, they are referred to as occipital spines (or horns) in the literature. To maintain uniform terminology in the literature for these structures, the term occipital spine is retained.

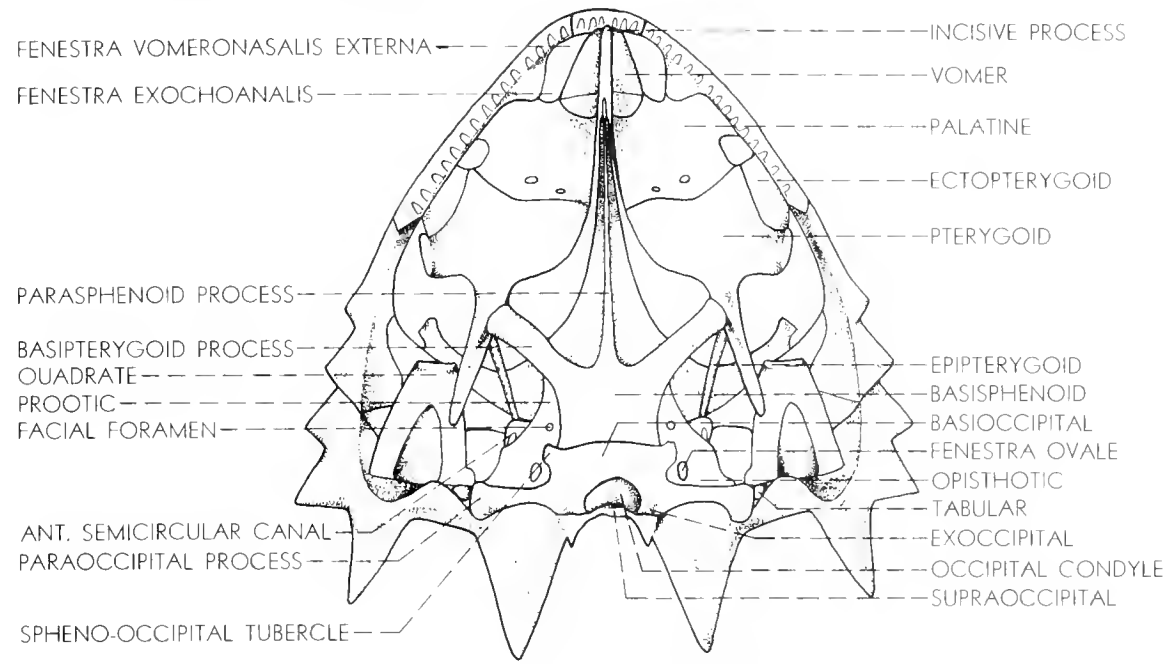


Fig. 2. *Phrynosoma platyrhinos platyrhinos*. Ventral view of the skull. BYU 22816, 22824, 22823. X 4.

The dorsal surface of the parietal bears many tubercles, some of which are usually present and variable in size in different specimens. Seven major tubercles are consistently present on all specimens examined. The seven tubercles are as follows: a single tubercle between the occipital spines which has been referred to as an interoccipital spine; a single tubercle on the dorsolateral surface at the base of each of the two occipital spines; a single, smaller tubercle on each dorsolateral side of the parietal immediately anterior to each of the tubercles located at the base of each occipital spine; two greatly enlarged tubercles located near the center of the parietal, one on each side of the imaginary midline.

The parietal articulates anteriorly with the frontal, lateroanteriorly with the postorbital, lateroposteriorly with the squamosal and tabular, ventrolaterally with the prootic and ventroposteriorly with the opisthotic and supraoccipital.

Note: The pineal foramen is located medially along the fronto-parietal suture and is bordered anteriorly by the frontal and posteriorly by the parietal. The fronto-parietal suture forms the boundary of the pineal foramen usually a little farther anteriorly than posteriorly.

Squamosal (Figs. 1 and 3) is located at the posterolateral angle of the skull and forms the ventrolateral border and approximately two-thirds of the lateral part of the posterior border of the supratemporal fossa. Each squamosal

bears three temporal spines, the longest spine being the most posterior and referred to as the first temporal spine. From posterior to anterior the temporal spines are progressively shorter.

Ventral and slightly mesial to the first temporal spine, the squamosal projects ventrally for articulation with the quadrate and ventromesially with the tabular. Articulation is also posterodorsally with the parietal anteromesially with the postorbital and anterolaterally with the jugal. The squamosal may have a few small tubercles on its dorsal surface.

Maxilla (Figs. 1 and 3) is located laterally to the premaxilla and prefrontal and bears approximately 14 conical, pleurodont teeth. The maxilla consists of three major projections. An anterior projection and a dorsal projection form the ventral and most of the lateral border of the fenestra exonarina. A posterior projection tapers ventrally, ventral to the anterior projection of the jugal. The anterior, dorsal, and posterior processes of the maxilla articulate with the premaxilla, prefrontal, and jugal respectively. The anterior process is the broadest (most massive), the dorsal process the shortest, and the slender posterior process the longest. Medially the maxilla articulates with the palatine.

Basioccipital (Fig. 2) is located ventral to the foramen magnum and posterior to the basisphenoid. In adult specimens a single occipital condyle exists which results from fusion of three

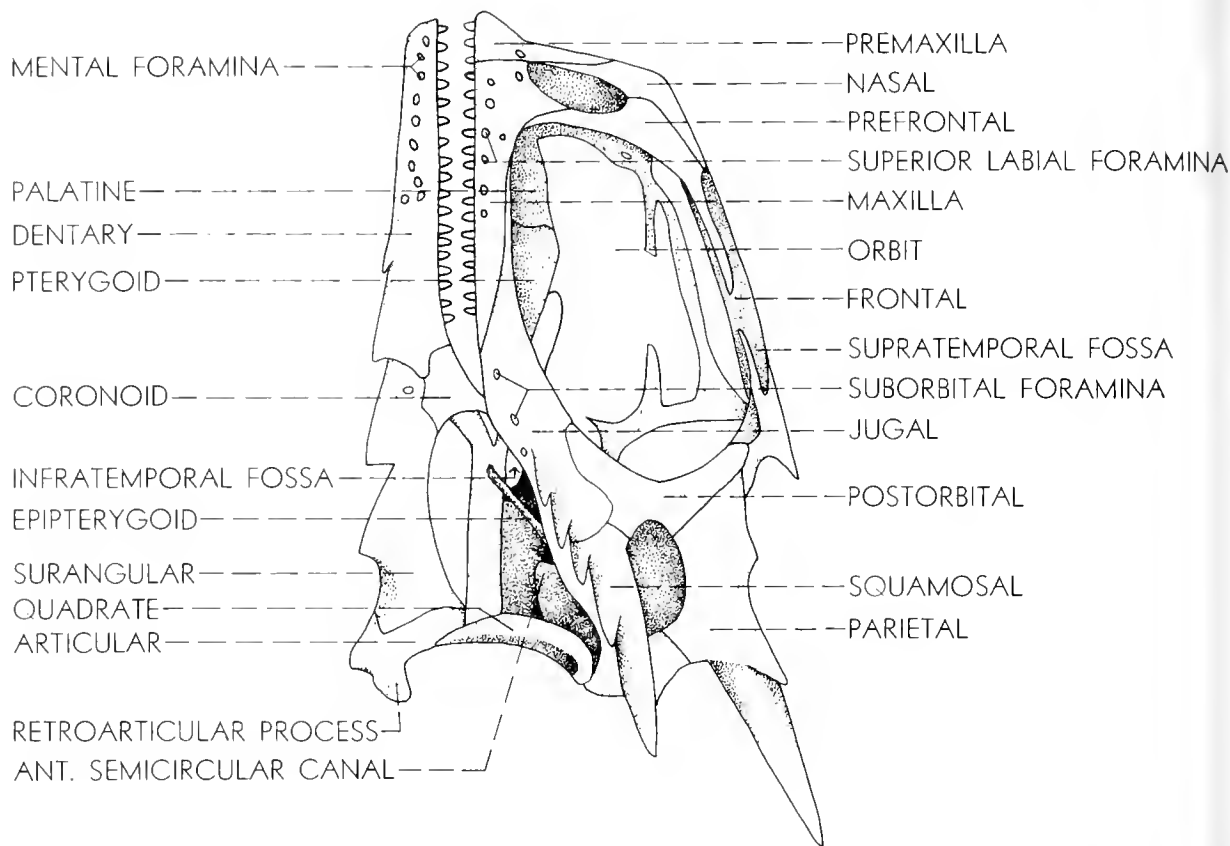


Fig. 3. *Phrynosoma platyrhinos platyrhinos*. Lateral view of the skull. BYU 22816, 22823, 22813. X 5.

occipital condylar divisions present in the immature lizard. The basioccipital forms the ventromedial part of the occipital condyle and fuses posterodorsolaterally with the exoccipital, to form a single occipital condyle, and laterally with the opisthotic.

On the anterolateral ventral surface, the basioccipital forms the posterior majority of the two speno-occipital tubercles. Articulation anteriorly is with the basisphenoid.

Supraoccipital (Fig. 2) borders the foramen magnum dorsally. The supraoccipital unites laterally with the opisthotic and ventrolaterally with the exoccipital. Dorsally, articulation is with the parietal.

Note: In adults the supraoccipital, exoccipital, and basioccipital are fused forming a single structure surrounding the foramen magnum. In juveniles some sutures can usually be seen which separate the several occipital bones and show distinctly the three embryonic condyles which form the single occipital condyle in adults.

Exoccipital (Fig. 2) forms the lateral border of the foramen magnum. The paraoccipital process of the exoccipital projects from the mesial

occipital laterally to articulate with the tabular. Occasionally the extreme lateroventral tip of the paraoccipital process lies next to the quadrate; however, in most cases the posteroventral part of the tabular lies between the paraoccipital process and the quadrate.

The posterior part of the posterior, ventral semicircular canal is formed by the lateral exoccipital and the most medial part of the paraoccipital process. The posterior part of the horizontal canal is formed by the dorsomesial part of the paraoccipital process.

Opisthotic (Fig. 2) is located anterior to the exoccipital and medial part of the paraoccipital process. The prootic and opisthotic are fused and form the otic capsule which is the enlarged area of the posterolateral wall of the braincase. The opisthotic forms the posterior part of the otic capsule and can usually be determined only by location in adults since it fuses anteriorly with the prootic. Posteriorly it fuses with the exoccipital and articulates with the tabular. Dorsally it contacts the supraoccipital and parietal and ventrally it articulates with the basioccipital.

Prootic (Fig. 2) forms the anterior part of the otic capsule and contains most of the anterior

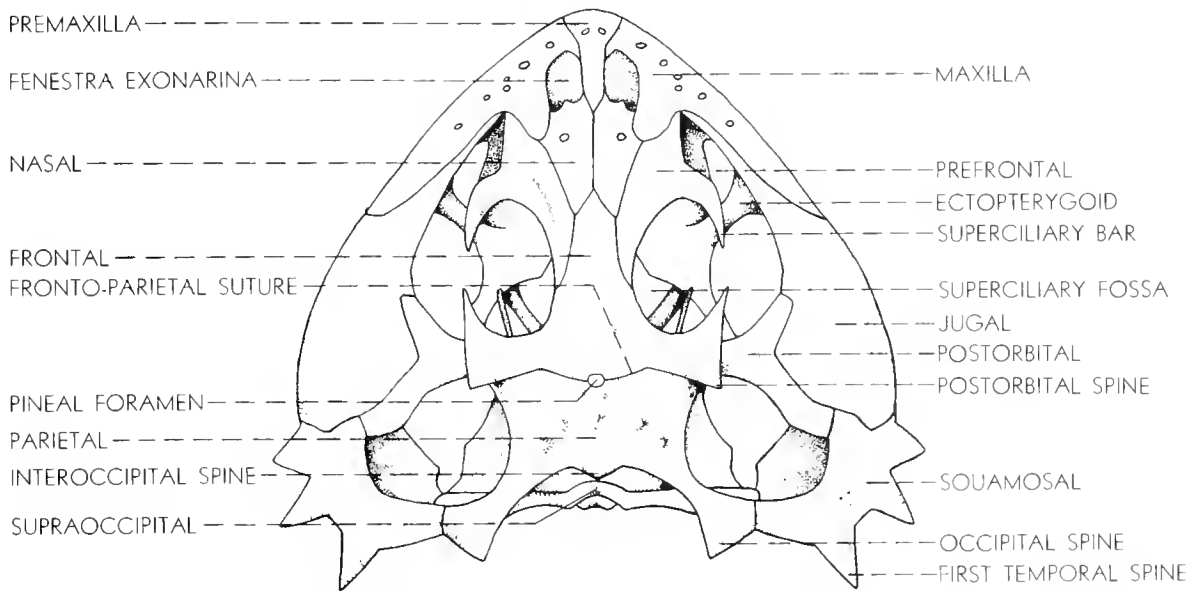


Fig. 4. *Phrynosoma douglassi hernandesi*. Dorsal view of the skull. BYU 22815, 22817. X 4.

semicircular canal. The prootic is fused posteriorly with the opisthotic and articulates with the parietal dorsally and with the basisphenoid ventrally.

The fenestra ovalis is located anterior and slightly ventral to the most medial part of the paraoccipital process and is formed anteriorly by the prootic and laterally by the opisthotic.

Tabular (Fig. 2) is located anterior and between the lateral paraoccipital process and the medial side of the posterior ventral projection of the squamosal. It articulates with the squamosal laterally, the opisthotic medioanteriorly and the parietal dorsally. Articulation is medially with the paraoccipital process and ventrally with the quadrate. The tabular can be observed by looking posteroventrolaterally through the supratemporal fossa. The extreme posteroventral tip of the tabular can be observed by looking at the posterior aspect of the skull. The tip articulates with the quadrate and appears to be fused with the squamosal to the extent that it is barely visible.

Quadrate (Figs. 2 and 3) is located anterior and ventral to the ventrally projecting part of the squamosal and articulates ventrally with the articular of the lower jaw to form the posteroventrolateral angle of the skull. The quadrate is roughly triangular, with the blunt apex joining ventrally with the articular. The medial and lateral sides of the quadrate are thickened and rounded (more so medially) and terminate dorsally as the major portions of a condyle. The quadrate is trough-shaped posteriorly and has a

slight anteriorly convex appearance. Articulation dorsally is with the squamosal and tabular.

Basisphenoid (Fig. 2) is located anterior to the basioccipital. The basisphenoid is Y-shaped with the apex of the Y being very broad and usually bears, at each posterolateral corner, a small posteriorly projecting process which forms the extreme anterior part of the spheno-occipital tubercle. The anterior arms of the Y are basiptyergoid processes of the basisphenoid and they articulate with the medial pterygoid at the point where the quadrate processes of the pterygoid are first distinguishable anteriorly. Articulation is dorsally with the prootic and posteriorly with the basioccipital. The parasphenoid process projects anteriorly from the anteromedial basisphenoid to the vomers, forms a base to the membranous interorbital septum, and serves as an attachment for membranes lying between the paired bones forming the roof of the mouth.

Pterygoids (Fig. 2) are located anterior to the two large basiptyergoid processes of the basisphenoid and form the floor of the orbits posterior to the palatines and medial to the ectopterygoids. Each pterygoid is a broad flat bone which bears a large laterally compressed quadrate process projecting posterolaterally and articulating with the ventral part of the medial side of the quadrate. The pterygoid articulates mesially with the basiptyergoid process of the basisphenoid near the far anterior part of the quadrate process of the pterygoid. Dorsal to the articulation of the pterygoid with the basiptyergoid process,

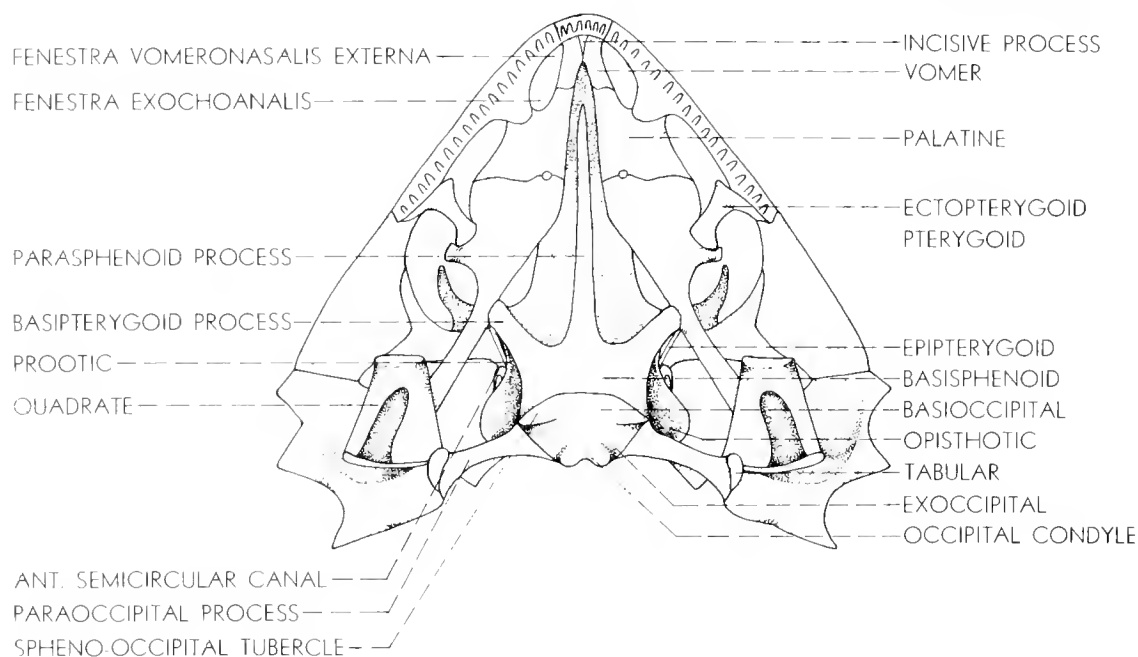


Fig. 5. *Phrynosoma douglassi hernandesi*. Ventral view of the skull. BYU 22815, 22817. X 3.5.

the quadrate process articulates with the epipterygoid. Articulation lateroanteriorly is with the ectopterygoid and anteriorly with the palatine. From the ventrolateroposterior surface of the pterygoid a small, tubercle-like process projects ventrally and slightly laterally, and joins the ectopterygoid anteriorly. Pterygoid teeth are lacking.

Ectopterygoid (Figs. 1 and 2) lies between the pterygoid and the upper jaw near the posterior part of the obliquely sutured articulation of the jugal and posterior process of the maxilla. Articulation is medially with the broad, flat part of the pterygoid including the tubercle-like process which projects ventrally and slightly laterally from the ventrolateroposterior pterygoid surface. Articulation is laterally with the medioventral surface of the upper jaw along the oblique suture formed by the jugal and maxilla.

Epipterygoid (Fig. 2) is a small, slender, rounded bone located anterior to the anterior semicircular canal and dorsal to the angle formed by the articulation of the pterygoid, and basipterygoid process of the basisphenoid. Articulation is ventrally with the dorsal (dorso-lateral) surface of the anterior part of the quadrate process of the pterygoid and dorsally with the prootic from the anterodorsal surface of the anterior semicircular canal. The epipterygoid is slightly curved medially and projects dorsally and slightly posteriorly from its ventral articulation.

Palatine (Fig. 2) forms the ventroanterior floor of the orbit anterior to the pterygoid. The palatine is slightly concave dorsally and forms the posterior border of the fenestra exochoanalis. Articulation is posteriorly with the pterygoid, anteromedially with the vomer, ventrolaterally with the maxilla and anterodorsolaterally with the prefrontal.

Vomer (Fig. 2) is located between the medial palatine and the premaxilla. The paired vomers articulate anteriorly but are separated posteriorly for most of their length. Each vomer can be divided into two parts in most specimens observed. The larger, anterior part forms the main body and articulates with its paired component anteriorly, and these in turn articulate with the premaxilla. The larger, anterior part forms the medial boundaries of the fenestra vomeronasalis externa and fenestra exochoanalis, articulating lateroposteriorly with the palatine and medioposteriorly with the smaller posterior part of the vomer. The smaller posterior part forms the posteromedial area of the vomer. It is triangular-shaped, variably fused with the larger anterior part of the vomer, and articulates posteriorly with the palatine.

Septomaxilla (not illustrated) is a paired structure located anteriorly within the nasal capsule and separates partition-wise the anterior nasal chamber from the cavity which houses Jacobson's organ. The septomaxilla is variously ossified, the more ossified part being centrally

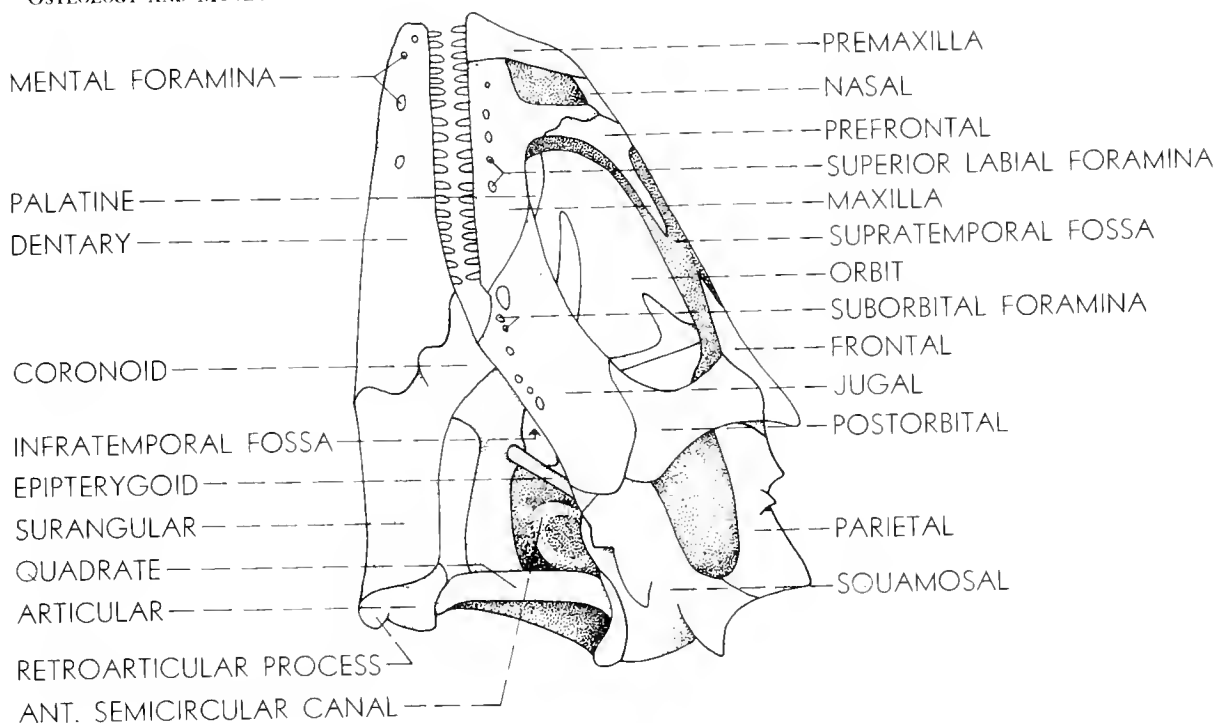


Fig. 6. *Phrynosoma douglassi hernandesi*. Lateral view of the skull. BYU 22815, 22817. X 4.

located within the dividing partition on either side of the skull. Peripherally, the ossified part is continuous with the cartilagenous and connective tissues respectively which attach ventrally to the vomer, medially to the nasal septum and laterally and dorsally to the border of the fenestra exonarina.

The Lower Jaw

Dentary (Fig. 3) is paired and forms the anterior one-half of the lower jaw, and bears on its mediodorsal surface all of the small, rounded conical-shaped, pleurodont teeth of the lower jaw. The dentary of each rami articulates anteriorly at the mental symphysis. Each dentary extends posteriorly from its anterior articulation with its paired component and has on its medial side a mediodorsal margin and a medioventral margin. Meckel's groove is located between the two margins. The anterior parts of the splenial and coronoid are wedged between the two margins posteriorly on the medial surface of the dentary. Articulation is dorsolateroposteriorly and ventroposteriorly with the surangular; posterodorsally with the coronoid; medially with the splenial; and ventromedioposteriorly with the angular.

Surangular (Fig. 3) is located posterior to the dentary. It has two complete mandibular spines projecting laterally from its lateral surface. Articulation is anterolaterally and anteroventrally

with the dentary; dorsoanteriorly with the coronoid; dorsomedially with the prearticular; ventromedially with the angular; and posteriorly with the articular.

Articular and Preaticular: the prearticular forms the most medial part of approximately the posterior half of the lower jaw. It fuses posteriorly with the articular. The articular (Fig. 3) forms the posterior end of the lower jaw, contains a posteroventromesially projecting retroarticular process, and has dorsoanteriorly a fossa for articulation with the ventral end of the quadrate. Articulation of the articular-preaticular complex is laterally with the surangular; medioventrally with the angular; anteroventrally with the splenial; and dorsoanteriorly with the coronoid.

Angular is located along the ventromedial part of the lower jaw at the approximate distance of the coronoid. The posterior part of the angular projects posteriorly beyond the posterior part of the coronoid, and articulates along its dorsoposterior surface with the prearticular. Articulation dorsoanteriorly is with the splenial, and ventrally and laterally with the surangular and dentary.

Splenial forms the medial surface of the lower jaw and is wedged anteriorly between the mediodorsal and medioventral margins of the dentary, and posteriorly between the prearticu-

lar and angular. Articulation is ventroanteriorly with the medioventral margin of the dentary; ventroposteriorly with the angular; dorsally (anterior to posterior) with the mediodorsal margin of the dentary, the ventral coronoid and prearticular.

Coronoid (Fig. 3) is located slightly posterior to the most posterior teeth and forms the medial, mediodorsal surface of the lower jaw dorsal to the splenial and anterior part of the prearticular. The coronoid is roughly triangular and has a slender anterior apex wedged between the mediodorsal margin of the dentary and the splenial. Posteriorly the coronoid projects dorsally to form the coronoid process of the lower jaw. Articulation is ventroanteriorly with the splenial, ventroposteriorly with the prearticular, dorsoanteriorly and lateroanteriorly with the dentary, and lateroposteriorly with the surangular.

Hyoid Apparatus

Hyoid is located between the mandibular rami deep to the throat musculature. The basihyal, hypohyal, ceratohyal, ceratobranchial I and ceratobranchial II are its component parts. The basihyal, being centrally located and the main

body of the hyoid, is used as a reference point for the other parts.

The hypohyal is a slender, elongated cartilaginous process which extends anteriorly from the anterior part of the basihyal at the midline.

The ceratohyal consists of two separate parts. A small, rather triangular shaped, dorsolaterally projecting part articulates proximally with the anterodorsolateral border of the basihyal and distally with the elongated, posterolaterally projecting part of the ceratohyal. The latter elongated part articulates anteriorly with the distal part of the anterior part of the ceratohyal and posteriorly with the distal part of the ceratobranchial I.

The ceratobranchial I projects posterolaterally from the dorsolateral border of the basihyal, posterior to the articulation of the small anterior part of the ceratohyal with the basihyal. Distally the ceratobranchial I is enlarged and articulates with the distal end of the elongated part of the ceratohyal.

The ceratobranchial II is reduced to a minute cartilaginous process which projects posteriorly from the posterolateral border of the ventral portion of the basihyal.

The ceratohyal, ceratobranchial I and ceratobranchial II are paired structures.

MYOLOGY OF THE HEAD AND THORAX OF *PHRYNOSOMA P. PLATYRHINOS*

Intermandibularis Complex

The intermandibularis complex constitutes the superficial throat musculature between the mandibular rami anterior to the ventral portion of the constrictor colli. This complex can be divided into three rather arbitrary divisions with the following descriptions:

(1) **M. intermandibularis anterior superficialis** (Fig. 7) originates on the anterior one-fifth of the mandibles and extends anteriorly and mesially to insert onto the ventromesial surface of the anterior part of the mandibular rami near the mental symphysis and in the ventral midline raphe respectively. This muscle is present to variable degrees and is usually pulled from the complex to remain with the integument upon dissection.

(2) **M. intermandibularis anterior profundus** (Figs. 7 and 13) originates posterior to the intermandibularis anterior superficialis to approximately one-half the length of the mandibular

rami. Fibers extend in a slightly posterior direction mesially in contrast to the anterior and mesially projecting fibers of the intermandibularis anterior superficialis. The originating, lateroposterior fibers are deep to the originating fibers of the mandibulohyoideus I. Insertion is in the ventral midline raphe.

(3) **M. intermandibularis posterior** (Figs. 7 and 13) originates along the posterior one-half of the mandibular rami and extends mesially to insert in the ventral midline raphe. Fibers of the intermandibularis posterior appear to be continuous posteriorly with the ventral fibers of the constrictor colli; however, by careful dissection the fibers of these two muscles can be separated.

M. constrictor colli (Figs. 7, 10, and 13) originates on the posterior part of the squamosal ventral to the first (longest) temporal spine. From the squamosal region fibers extend laterally and ventrally around the neck posterior to the retroarticular process and intermandibularis posterior, and insert in the mid-ventral raphe. The

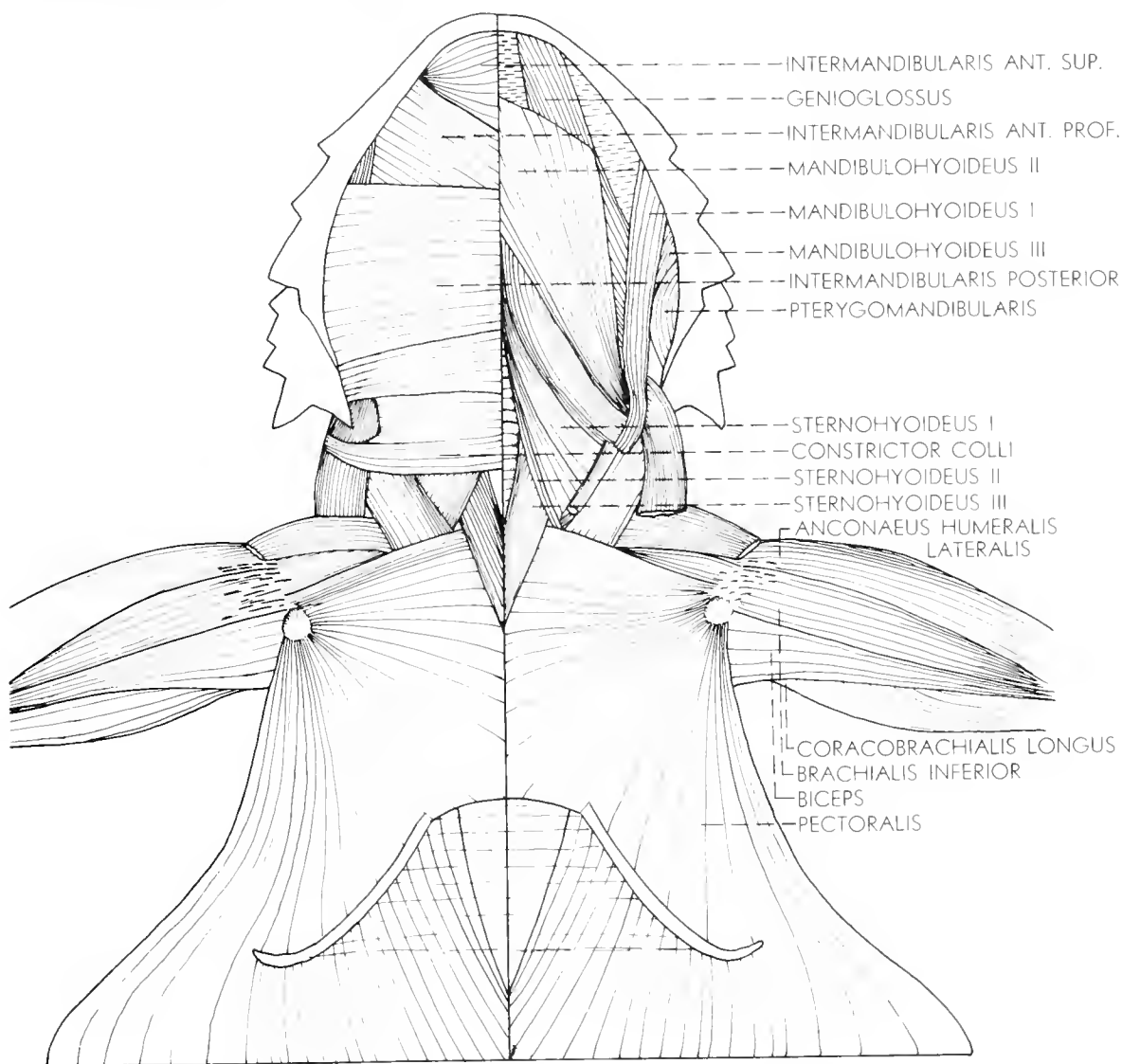


Fig. 7. *Phrynosoma platyrhinos platyrhinos*. Ventral view of head and thorax musculature. Left Half: superficial layer. Right Half: first depth. BYU 14838, 22832, 22839, 22833, 22830, 22840, 22860, 22838, 22841. X 3.5.

constrictor colli is deep to the skin and overlays superficially the depressor mandibulae.

M. pectoralis (Figs. 7 and 16) originates along the mid-ventral line of the sternum and separates anteriorly to allow for origin of the sterno-hyoideus. Origin continues anteriorly from the separation along the interclavicle and clavicle. Posteriorly from the separation, fibers arise from the midline of the sternum and laterally along the xiphoid rod to the area posterior to the ventral extension of the third sternal rib. Fibers extend (anterior to posterior) posterolaterally, laterally, and anterolaterally, converging for a double insertion. The most anterior fibers insert in the fascia which superficially covers the shoulder muscles. The remaining fibers insert

onto the deltopectoral crest of the humerus.

M. mandibulohyoideus I (Fig. 7) originates from the ventromesial borders of the mandibular rami at approximately the level of the third (counting posterior to anterior) mandibular spine. Fibers extend posteromesially overlaying much of the mandibulohyoideus III and a small portion of the mandibulohyoideus II, and insert onto the posterior one-third of the distal ceratobranchial I in an overlapping manner, overlapping portions of the insertion and origin of the mandibulohyoideus II and hyoglossus respectively.

M. mandibulohyoideus II (Fig. 7) originates from a small, narrow tendon which extends posteriorly from the mandibular symphysis and ap-

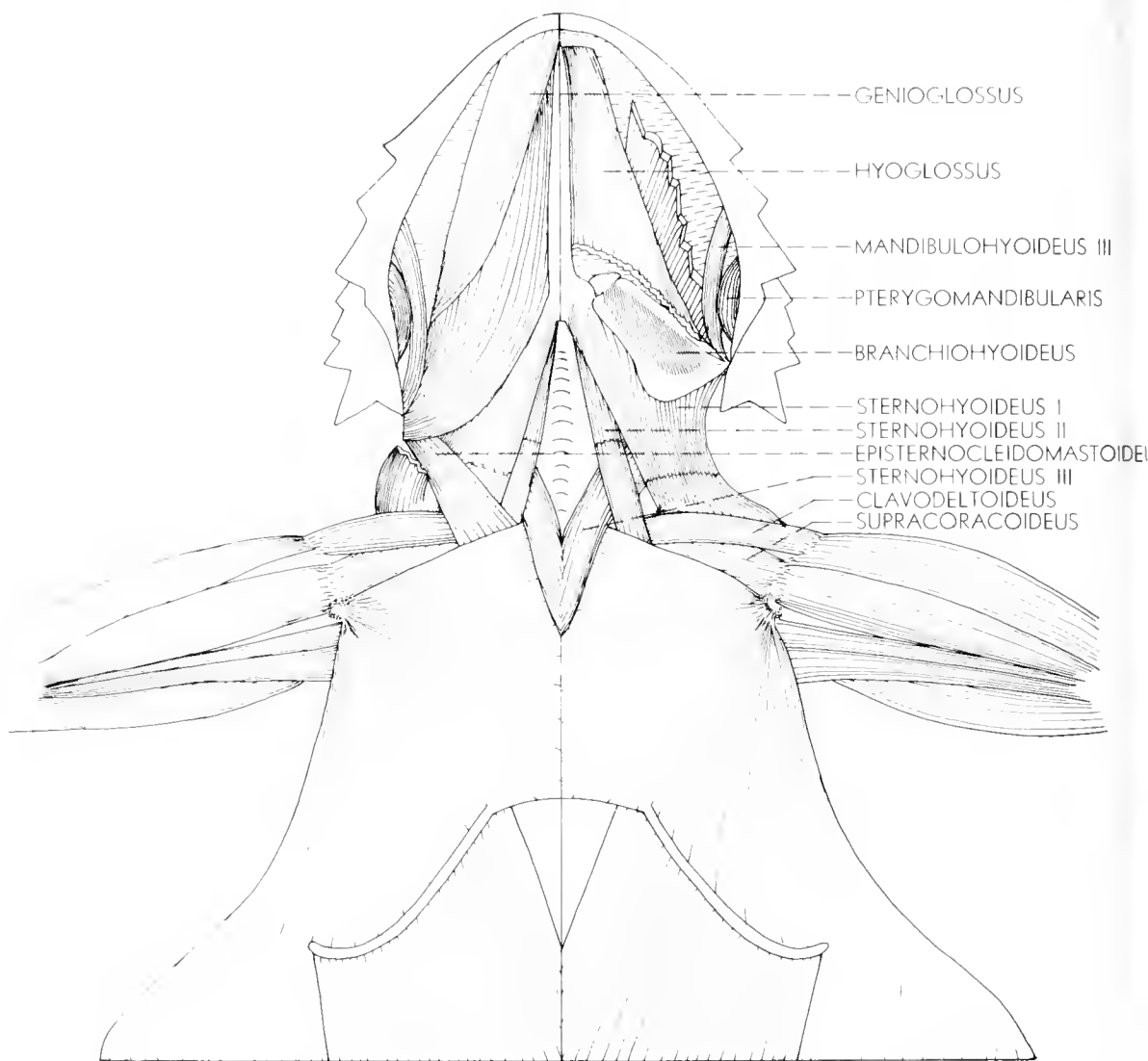


Fig. 8. *Phrynosoma platyrhinos platyrhinos*. Ventral view of head and thorax musculature. Left Half: second depth. Right Half: third depth. BYU 22838, 22839, 22841, 22840, 22833, 22861, 22830, 22832, 22860. X 3.5.

pears continuous with the midline raphe to the wider, anterior part of the muscle. From the wider, anterior part of the muscle where fibers meet at the midline raphe to form the tendinous origin, fibers separate in an inverted V form and extend posterolaterally to insert onto the distal one-third of the ceratobranchial I. Approximately the most distal fourth of this muscle is overlapped superficially by the mandibulohyoideus I. The mandibulohyoideus II is deep to the intermandibularis complex, mesial to the mandibulohyoideus I, and overlaps parts of the genio-glossus and hyoglossus.

M. latissimus dorsi (Figs. 10 and 14) originates deep to the skin from the thick, superficial, dorsal fascia of the back.

The fibers of this broad, thin, rather triangu-

lar-shaped muscle extend anteroventrolaterally and split into a large anterior body and small posterior slip. The anterior body is composed of approximately three-fourths of the muscle fibers which continue between the anconaeus coracoides and anconaeus scapularis muscles to insert tendinously onto the processus latissimus dorsi of the humeral shaft. The posterior slip is composed of the remaining posterior muscle fibers (approximately one-fourth of the muscle) and extends anteroventrally to insert onto the lateral, posteriorly extending fibers of the pectoralis approximately five millimeters posterior to the delto-pectoral crest (insertion of the pectoralis) of the humerus.

M. anconaeus scapularis (Figs. 10 and 16) originates from the lateroposterior scapular sur-

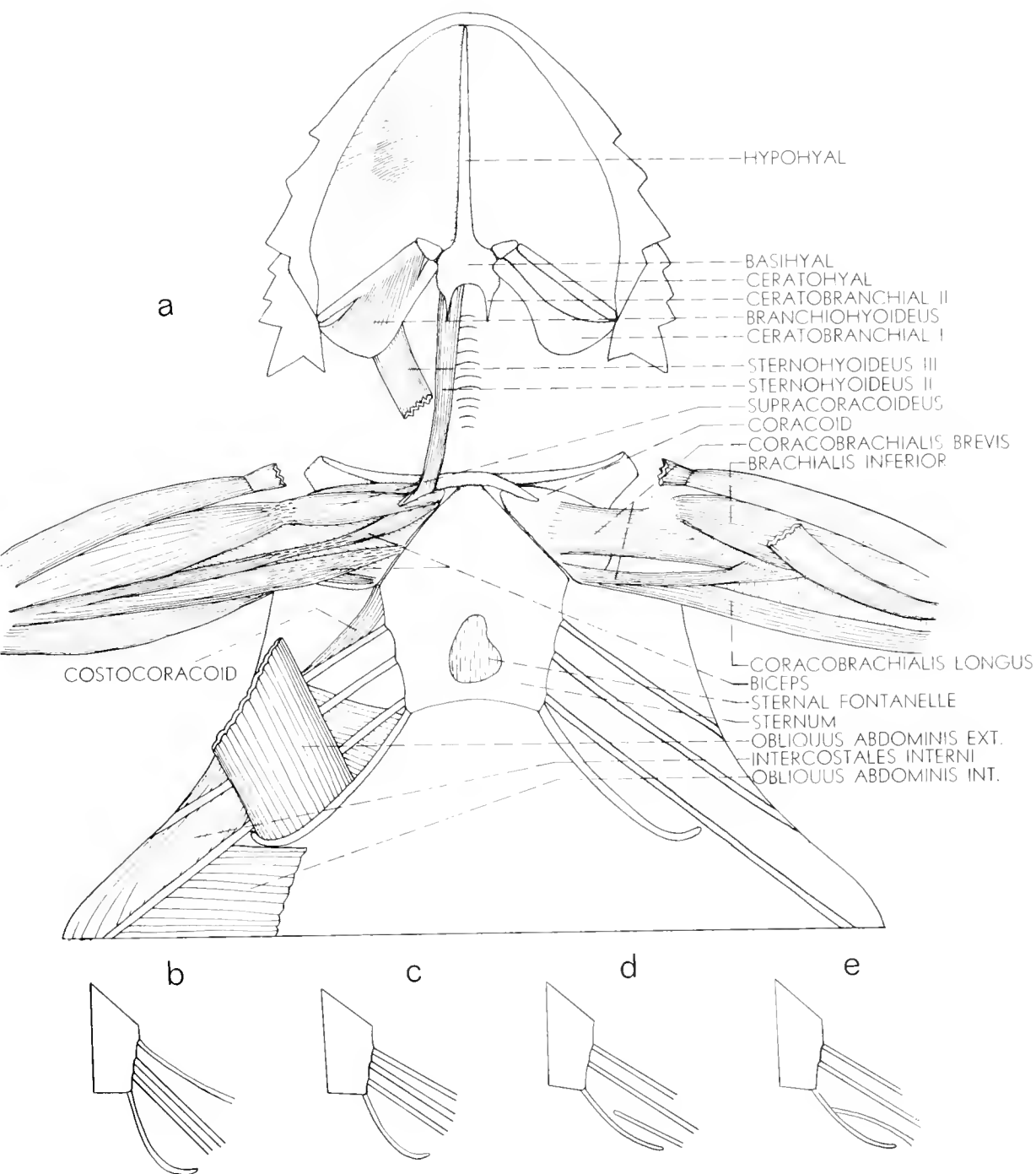


Fig. 9. Ventral view of head and thorax of: a. *Phrynosoma p. platyrhinos*, ventral view of head and thorax musculature. Left Half: fourth depth. Right Half: fifth depth, also showing sternum and rib attachments. BYU 22832, 22830, 22840, 22860, 22839, 22841, 22833, 22823, 22831, 22818. b. *Phrynosoma ditmarsii* USNM 36022, left half of sternum and rib attachments. c. *Phrynosoma douglassii* BYU 22817, left half of sternum showing rib attachments. d and e. *Phrynosoma p. platyrhinos*, BYU 22830; 22841, left half of sternum showing rib attachments and arrangement. X 3.5.

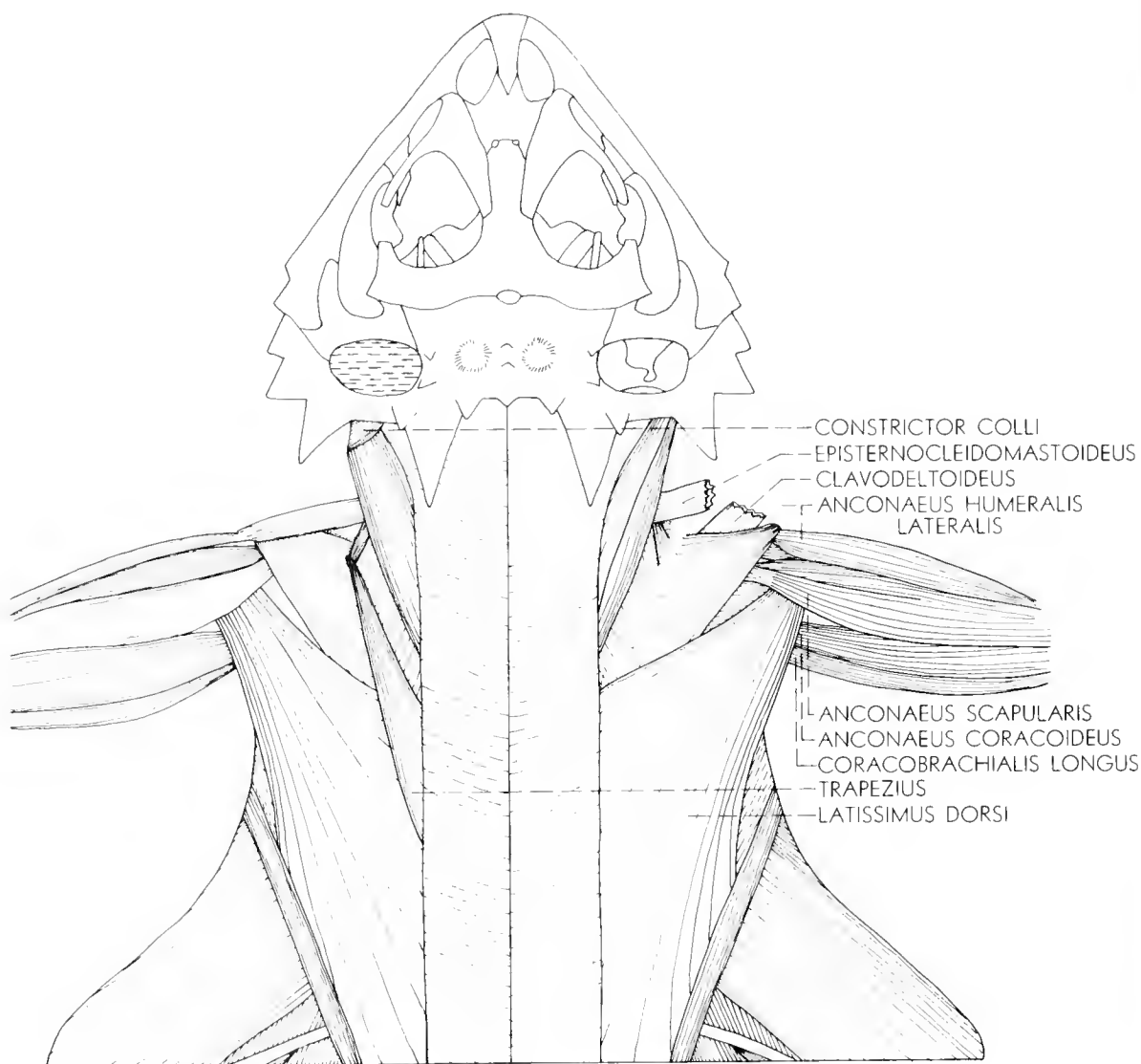


Fig. 10. *Phrynosoma platyrhinos platyrhinos*. Dorsal view of head and thorax musculature. Left Half: superficial layer. Right Half: first depth. BYU 14838, 22833, 22823, 22840, 22832, 22830, 22861. X 3.5.

face by a tendon which extends laterally between the subscapularis II and the scapulohumeralis anterior, continues deep to the distal fibers of the scapulodeltoideus and attaches to the anterior head of the humerus, deep to the anterior inserting fibers of the scapulodeltoideus. The tendon gives rise to muscle fibers in the area between the scapulodeltoideus and the latissimus dorsi. At the point where muscle fibers begin, there is a rather complete separation of the muscle into an anterior smaller bundle and a larger posterior bundle. These bundles unite approximately one-half the length of the brachium and continue as one mass to insert onto the olecranon process of the ulna and the above sesamoid.

M. anconaeus coracoideus (Fig. 10) originates mainly by a long, narrow tendon from the lateral apex of a broad triangular-shaped tendon located posterior and dorsal to the distal fibers of the subscapularis II and the subscapularis I respectively. The anterior apex of the triangular-shaped tendon unites with the inner surface of the scapula anterior to the mesial head of the subscapularis II, whereas the posterior apex attaches to the inner surface of the coracoid near its posterior tip. The lateral apex forms a long, narrow tendon which gives rise to muscle fibers of the anconaeus coracoideus posterior to the distal fibers of the anterior body of the latissimus dorsi. Some dorsal fibers of the anconaeus coracoideus arise by a short tendinous head from the

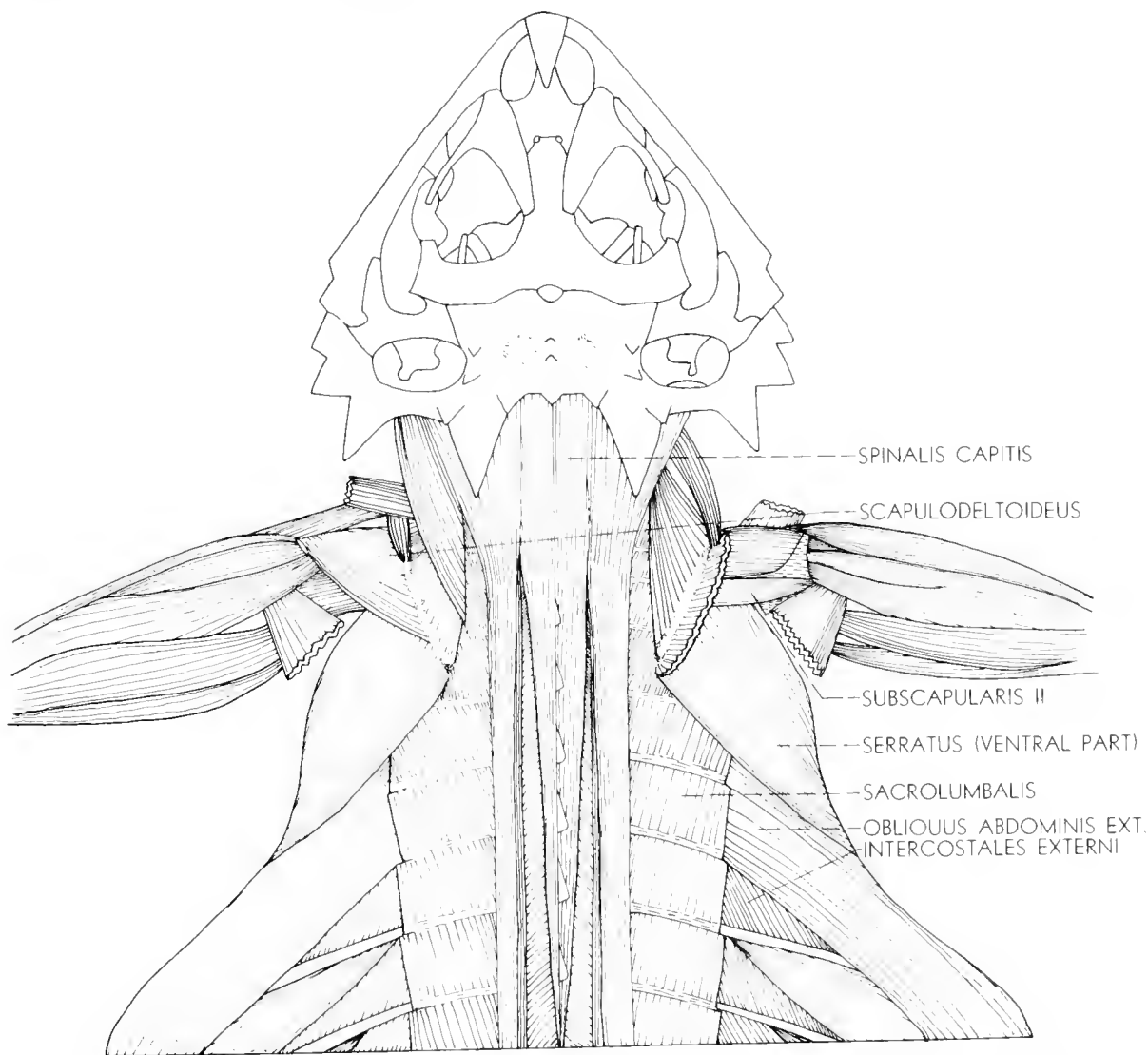


Fig. 11. *Phrynosoma platyrhinos platyrhinos*. Dorsal view of head and thorax musculature. Left Half: second depth. Right Half: third depth. BYU 22838, 22833, 22839, 22860, 22841, 22832, 22861, 22830, 22823. X 3.5.

distal posterior fibers of the latissimus dorsi. Fibers extend laterally posteroventral to the anconaeus scapularis, dorsoposterior to the anconaeus humeralis medialis and posterodorsal to the coracobrachialis longus, and unite distally with the anconaeus scapularis for a common insertion with the latter onto the olecranon process of the ulna and the above sesamoid.

M. anconaeus humeralis lateralis (Figs. 7, 10, and 16) originates mesial to the insertions of the scapulodeltoideus and posterior clavodeltoideus from the proximal head of the humerus and the entire anterior, humeral shaft. Fibers proceed ventral to the anconaeus scapularis and antero-dorsal to the brachialis inferior, somewhat integrating proximally with the brachialis inferior and to a greater degree with the anconaeus

scapularis distally. Insertion is with the rest of the anconaeus complex on the olecranon process of the ulna and the above sesamoid.

M. brachialis inferior (Figs. 7, 9, and 15) originates from the humeral delto-pectoral crest posterior to the insertions of the clavodeltoideus and supracoracoideus along the proximal approximately four-fifths of the anteroventral humeral shaft. Fibers extend distally ventral to the anconaeus humeralis lateralis and anterior to the biceps, integrating proximally to a lesser degree with the fibers of the former and more so distally with those of the latter. Insertion is onto the radius.

M. biceps (Figs. 7 and 9) originates from the medioanterior border of the ventral surface of the coracoid by a muscular head and a long,

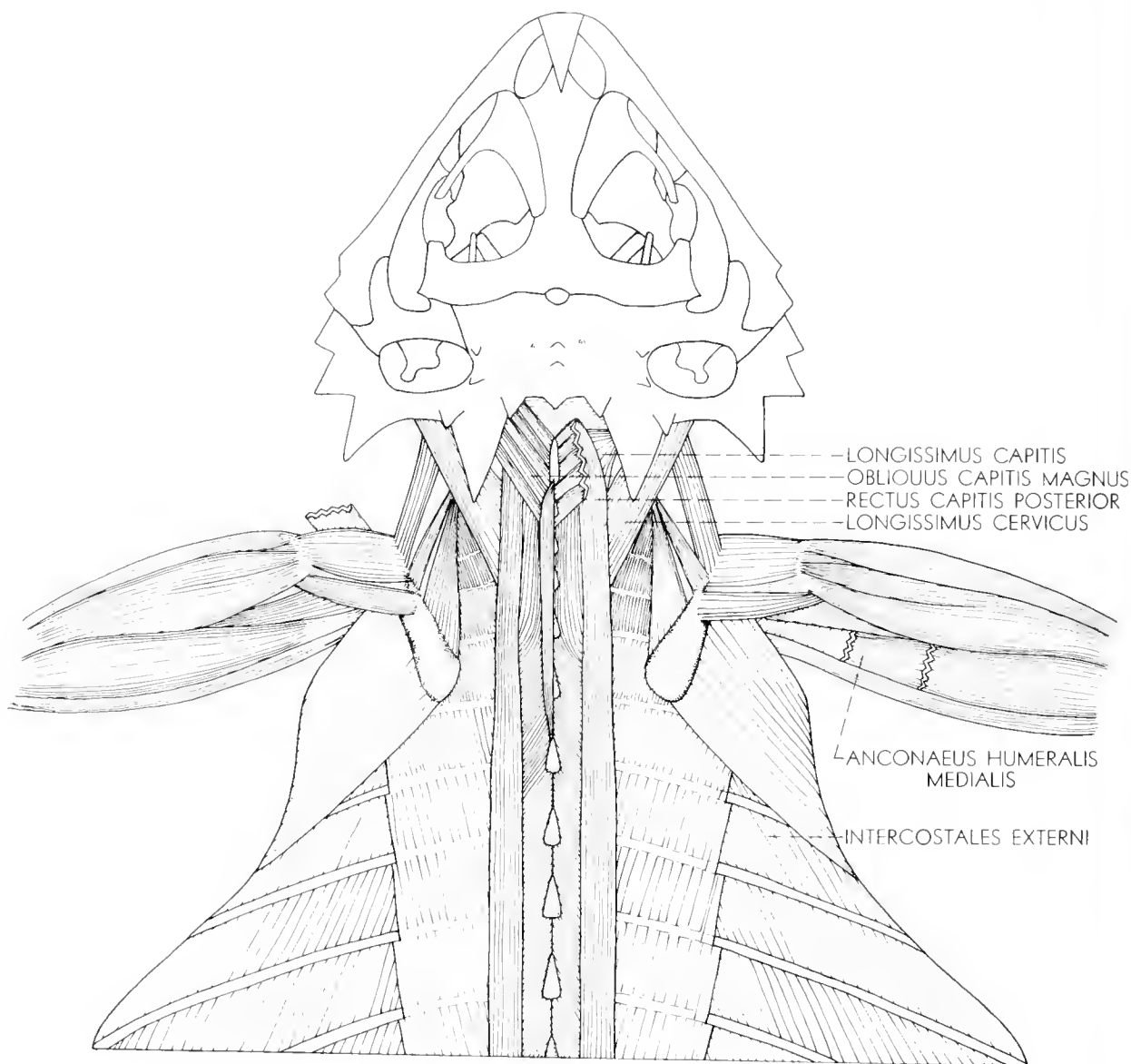


Fig. 12. *Phrynosoma platyrhinos platyrhinos*. Dorsal view of head and thorax musculature. Left Half: fourth depth. Right Half: fifth depth. BYU 22832, 22823, 22830, 22841, 22831. X 3.5.

rather broad, slender tendon. The originating muscular head is located anterior to the long, slender tendon and consists of a small body of muscle. Fibers of the small, muscular body converge immediately from the origin to give rise to a very narrow tendon. The narrow tendon continues distally paralleling the larger, posterior originating tendon which arises directly from the coracoid posterior to the origin of the muscular head. The two tendons give rise to two bodies of muscle fibers respectively in the area posterior to the deltopectoral crest of the humerus. The two muscular bodies continue distally posterior to the brachialis longus. Distal-

ly the anterior body integrates somewhat with fibers of the brachialis inferior and the two muscular bodies join with the latter to form a common tendon. The common tendon extends between the radial and ulnar humeral processes and bifurcates for insertion onto the ventral surfaces of the proximal radial and ulnar heads. The two muscular bodies are often better separated from each other or seen by viewing the biceps from its dorsal surface.

M. coracobrachialis longus (Figs. 7, 9, and 10) originates tendinously from the extreme posterolateral tip of the coracoid and extends along the posterior brachium superficially, posterovent-

tral to the anconaeus scapularis and posterodorsal to the biceps, overlapping the deep anconaeus humeralis medialis. Fibers insert distally onto the proximal surface of the ulnar process.

M. coracobrachialis brevis (Fig. 9) originates from the posterior approximate two-thirds of the ventral surface of the coracoid. At the origin the fibers are separated into anterior and posterior parts consisting of approximately four-fifths and one-fifth of the muscle mass respectively. Fibers extend laterally and slightly posteriorly dorsal to the proximal bicipital tendons to insert as a continuous muscular mass onto the humeral head, the concave area between the delto-pectoral and humeral crests, and the proximal half of the posteroventral humeral surface.

M. anconaeus humeralis medialis (Fig. 12) originates from the humeral crest and the entire length of the posterodorsal surface of the humeral shaft. The anconaeus humeralis medialis is located deep anteriorly to the anconaeus coracoideus, deep posteroventrally to the anconaeus scapularis, and deep anterodorsally to the coracobrachialis longus. Small bundles of fibers unite distally with the anconaeus coracoideus, anconaeus scapularis and anconaeus humeralis lateralis for a common insertion onto the olecranon process of the ulna and the above sesamoid.

Anconaeus Complex

In the distal approximate one-half of the brachium where the anconaeus muscles appear to partially unite one with another, the muscle fibers do not really intermingle but tripinnately and bipinnately form two small, narrow tendons which are continuous with the major extreme distal, common tendon of the anconaeus complex. Numerous small fiber-like slips appear to terminate in the two tendons. We believe, however, that the continuing fascia of each slip forms the two tendons. The longer of the two tendons receives slips from the anconaeus scapularis, anconaeus humeralis lateralis and anconaeus humeralis medialis. The shorter and most obscure of the two tendons receives slips from the anconaeus scapularis and anconaeus coracoideus. These tendons are located at the area of adjoining slips of the foregoing muscles.

M. genioglossus (Figs. 7 and 8) originates from the ventral and mesial surfaces of the anterior one-fifth of the mandibular rami. Fibers extend in a posterolateral direction overlapping ventromesially in a flap-like manner the anterolateral portion of the hyoglossus. The laterally attached fibers of the flap integrate dorsally

with those of the hyoglossus and lateral fibers of the tongue. Distally, fibers extend dorsally and insert onto the dorsolateral surface of the ceratohyal.

M. hyoglossus (Fig. 8) originates along the lateroventral, ventral and posteroventral surfaces of the distal one-half of the ceratobranchial I. Fibers pass anteriorly, ventral and lateral to the ceratobranchial I, lateral to the ceratohyal, and ventrolateral and lateral to the basihyal and hypohyal. Fibers are continuous laterally with those of the genioglossus, and slightly anterior to the basihyal. The dorsal fibers become continuous with those of the tongue. The ventral fibers continue anteriorly, lateral to the hypohyal, and extend dorsally most anteriorly to become continuous with fibers of the anterior part of the tongue. Insertion is in the tongue and the oral-pharyngeal tissue forming the floor of the mouth and pharynx. The majority of the fibers of the hyoglossus are continuous with the muscular tongue.

Sternohyoideus Complex

The sternohyoideus complex consists of three separate muscles which arise from the anterior sternal and scapular areas and insert along the posterior hyoid apparatus.

(1) **M. sternohyoideus I** (Figs. 7 and 8) originates mainly from the mesial surface of the scapula, however, a few bundles take origin from the most anterior part of the clavicle. Fibers extend anteromesially, ventral to the episternocleidomastoideus and continue nearly parallel with the ceratobranchial I to insert along the posterior border of the anterior two-thirds of the ceratobranchial I and the ventroposterior border of the basihyal. Although the fibers appear to form a continuous mass at the insertion, those inserting along the posterior border of the ceratobranchial I are partially divided into slips.

(2) **M. sternohyoideus II** (Figs. 7, 8, and 9) originates from the anterolateral surface of the sternum slightly posterior to the lateral process of the interclavicle. Fibers extend anteriorly and slightly mesially, and divide into two bundles just before reaching the small ceratobranchial II. The divisions continue on either side of the small ceratobranchial II to insert onto the dorso-posterior surface of the basihyal.

(3) **M. sternohyoideus III** (Figs. 7, 8, and 9) originates from the ventral surface of the posterior part of the anterior one-third of the sternum. Fibers extend anterolaterally ventral

to the sternohyoideus II and sternohyoideus I to insert onto the dorsal area of the posterior surface of the most enlarged part of the ceratobranchial II.

M. branchiohyoideus (Figs. 8 and 9) originates from the anterodorsal border of the distal four-fifths of the ceratobranchial I. Fibers extend anteromesially from the ceratobranchial I to insert onto the posterior border of the proximal two-thirds of the ceratohyal. The branchiohyoideus covers nearly the entire area between the ceratobranchial I and the ceratohyal and lies dorsal to the posterior approximate one-third of the hyoglossus.

M. pseudotemporalis superficialis (Fig. 16) originates from the parietal along the anterior posteromesial border of the supratemporal fossa. Fibers overlap the mesial and dorsomesial fibers of the adductor mandibularis externus and only with difficulty can be separated into a rather distinguishable separate muscle. There is some question as to whether the pseudotemporalis superficialis should actually be considered as a separate muscle, or a part of the adductor mandibularis externus medius. Considering the pseudotemporalis superficialis as a separate muscle, with the foregoing understanding of its obscure separability, fibers extend anteroventrally from the origin along the dorsomesial and mesial fibers of the adductor mandibularis externus to insert onto the mesial surface of the coronoid.

M. pseudotemporalis profundus (Fig. 17) originates along the ventral four-fifths of the anterior, lateral and posterior borders of the epipterygoid. Fibers extend slightly anteroventrally along the ventral epipterygoid forming a triangular-shaped muscle with the apex at the origin. The broader, ventral fibers insert onto the mesial surangular slightly posterior and ventral to the mesial surface of the coronoid.

M. adductor mandibularis externus (Figs. 14 and 15) originates inside the supratemporal fossa from the squamosal, parietal, postorbital, jugal, quadrate, and opisthotic. Fibers extend anteroventrally to insert onto the coronoid, dorsal part of the surangular and superficial aponeurosis of the infratemporal region. The adductor mandibularis externus is best considered a single, massive muscle which can be somewhat separated into a dorsolateral, superficial sheet-like flap and a large massive body medial to the superficial flap. Some medial fibers can occasionally be partially separated from the massive medial body, however, this is difficult to do in most cases.

M. adductor mandibularis posterior (Fig. 16) originates from the posterior surface of the quadrate ventral to the adductor mandibularis externus. Fibers intermingle with the ventral fibers of the adductor mandibularis externus, which makes separation into an individual entity difficult. From the origin, fibers extend anteroventrally to insert onto the dorsal surface of the extreme posterior surangular and the dorsal surface of the articular.

Note: The adductor mandibularis museles are difficult to separate from each other. It would perhaps be as well to consider the whole complex as the adductor mandibularis and note that the muscular mass is often partially segmented in some areas.

M. levator angularis oris (Fig. 16) originates from the medioanterior surface of the squamosal and the ventrolateral surface of the postorbital. Fibers extend anteroventrally, ventral to the lateral part of the postorbital and the posterior part of the jugal, to insert onto the anterior and anterodorsal surfaces of the coronoid.

M. levator pterygoideus (Fig. 18) originates tendinously from the ventrolateral parietal near the anteromesial border of the supratemporal fossa. Fibers extend ventrally, posterior and mesial to the epipterygoid to insert onto the posterior part of the anterior one-third of the quadrate process of the pterygoid.

M. protractor pterygoideus (Fig. 18) originates from the lateral surface of the anterior prootic, mesial and anteromesial to the anterior semicircular canal. Fibers extend lateroventrally and slightly posteriorly to insert onto the posterior one-half of the quadrate process of the pterygoid.

M. levator scapulae superficialis (Figs. 16 and 17) originates tendinously from the ventrolateral diapophysis of the atlas. The levator scapulae superficialis is triangular in shape with the apex at the origin. Fibers extend posteriorly ventral to the longissimus cervicis to insert onto the anterolateral edge of the suprascapula.

M. levator scapulae profundus (Figs. 16 and 17) originates tendinously with the levator scapulae superficialis from the ventrolateral diapophysis of the atlas. Fibers extend posteriorly ventral and parallel to those of the levator scapulae superficialis and insert onto the anterolateral edge of the ventral suprascapula and the dorsal end of the clavicle. In some specimens the levator scapulae profundus does not appear to be separable from the levator scapulae super-

ficialis. However, the two muscles can usually be carefully separated into two main bodies, the levator scapulae superficialis being dorsal and the largest.

M. scapulodeltoideus (Figs. 11, 14, and 15) originates from the dorsal clavicle and the anterolateral side of the ventral two-thirds of the suprascapula.

The originating posterior fibers are deep to those of the posterior trapezius and anterior latissimus dorsi. From the origin fibers extend ventrally and insert onto the anterior humeral head deep to the clavodeltoideus.

M. clavodeltoideus (Figs. 8, 10, and 14) originates from the posterior proximal one-third of the clavicle and the anterolateral area of the lateral process of the interclavicle. Posteriorly, fibers overlap the insertion of the scapulodeltoideus and insert onto the humeral head slightly posterior to the insertion of the scapulodeltoideus.

M. episternocleidomastoideus (Figs. 8, 10, and 16) originates from three heads. The sternohyoideus II trisects the originating fibers of the episternocleidomastoideus, therefore the sternohyoideus II is conveniently used as a reference point proximally. Ventromesial fibers of the episternocleidomastoideus originate from the dermis of the skin and are usually torn loose from the origin and overlooked when the specimen is skinned. This head overlies the sternohyoideus II ventromesially to the other two heads. Another head originates along the ventral and anterior sides of the lateral process of the interclavicle. This head lies dorsal and mesial to the trisecting fibers of the sternohyoideus II. The third head originates from the lateral edge of the anterior part of the sternum and overlies ventrally the origin of the sternohyoideus II. The fibers of the three heads come together to form the belly of the muscle which rises sharply anterodorsally, deep to the clavodeltoideus for a single insertion onto the post-ventral squamosal and extreme lateral paraoccipital process ventral and mesial to the insertion of the depressor mandibularis.

M. sacrolumbalis (Figs. 11, 15, and 18) originates from the most lateral, dorsal and anterior surfaces of the enlarged transverse process of the first sacral vertebrae and the anterior and lateral surfaces of the crest of the ilium. A few fibers are periodically continuous with those of the dorsal back musculature by interconnecting, slender tendons running obliquely postmesially from the sacrolumbalis. From the origin, fibers

continue anteriorly and slightly laterally to insert tendinously onto the ribs and most distally onto the anteroventrolateral process of the axis.

M. supracoracoideus (Figs. 8, 9, and 15) originates from the anteroventral surface of the coracoid. Fibers extend posteroventrolaterally posterior and ventral to the clavodeltoideus to insert onto the anteroventrolateral surface of the proximal head of the humerus.

M. scapulohumeralis anterior (Fig. 16) originates from the anterolateral surface of the scapula and the primary coracoid ray. Fibers extend ventroposteriorly forming a broad, thin muscular sheet. Anteroventral fibers overlap superficially those of the dorsal supracoracoideus and are partially divided into a ventral, originating head from the primary coracoid ray. The thin muscle sheet continues ventroposteriorly passing deep to the originating tendon of the anconaeus scapularis and inserts onto the dorsomesial surface of the proximal head of the humerus mesial to the proximal insertion of the anconaeus humeralis lateralis.

M. mandibulohyoideus III (Figs. 7 and 8) originates from the ventromesial borders of the mandibular rami posterior and slightly dorsal to the originating fibers of the mandibulohyoideus I at approximately the level of the second (counting posterior to anterior) mandibular spine. Fibers pass dorsal and lateral to the mandibulohyoideus I, mesial to the pterygomandibularis and insert onto the posterior end of the ceratohyal.

M. pterygomandibularis (Figs. 7 and 8) originates from the posterior area of the small, posteroventrolateral process of the pterygoid, the ventral and lateral parts of the larger posterior quadrate process of the pterygoid and the ventral, anterior part of the basisphenoid. Fibers extend posteroventrally (mostly ventrally) lateral to the mandibulohyoideus II and mesial to the posterior mandibular ramus to insert onto the ventral and lateral surfaces of the articular.

M. depressor mandibularis (Figs. 15 and 16) originates from the posterior, ventral projection of the squamosal, ventral to the first (largest) temporal spine. The posteromesial originating fibers overlap superficially the anterolateral fibers of the episternocleidomastoideus. From the origin, fibers extend ventrally and slightly anteriorly to insert onto the retroarticular process of the articular, deep to the insertion of the cervicomandibularis. Fibers are deep to the constrictor colli proximally and the cervicomandibularis distally.

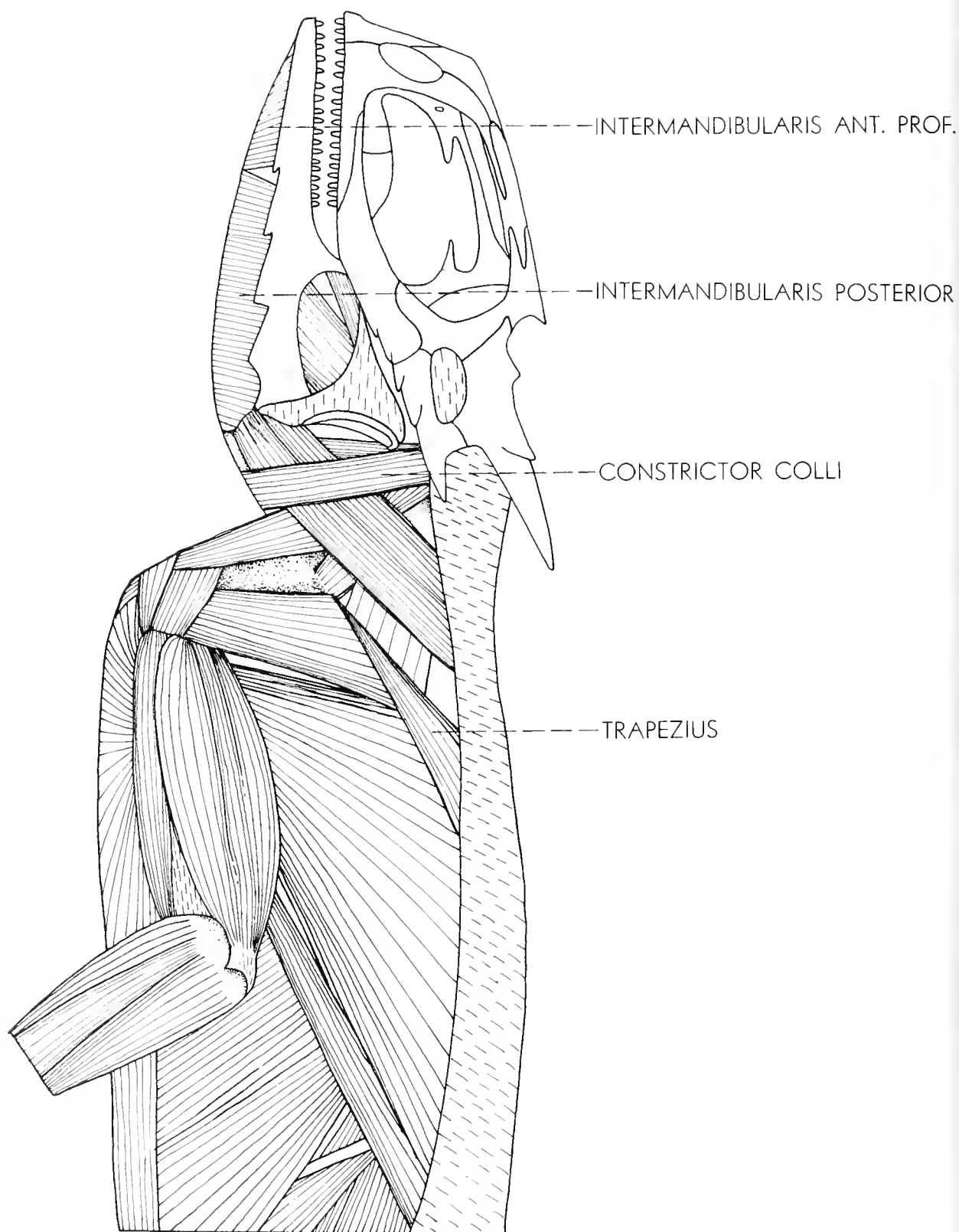


Fig. 13. *Phrynosoma platyrhinos platyrhinos*. Lateral view of head and thorax musculature. Superficial layer. BYU 14838. X 5.5.

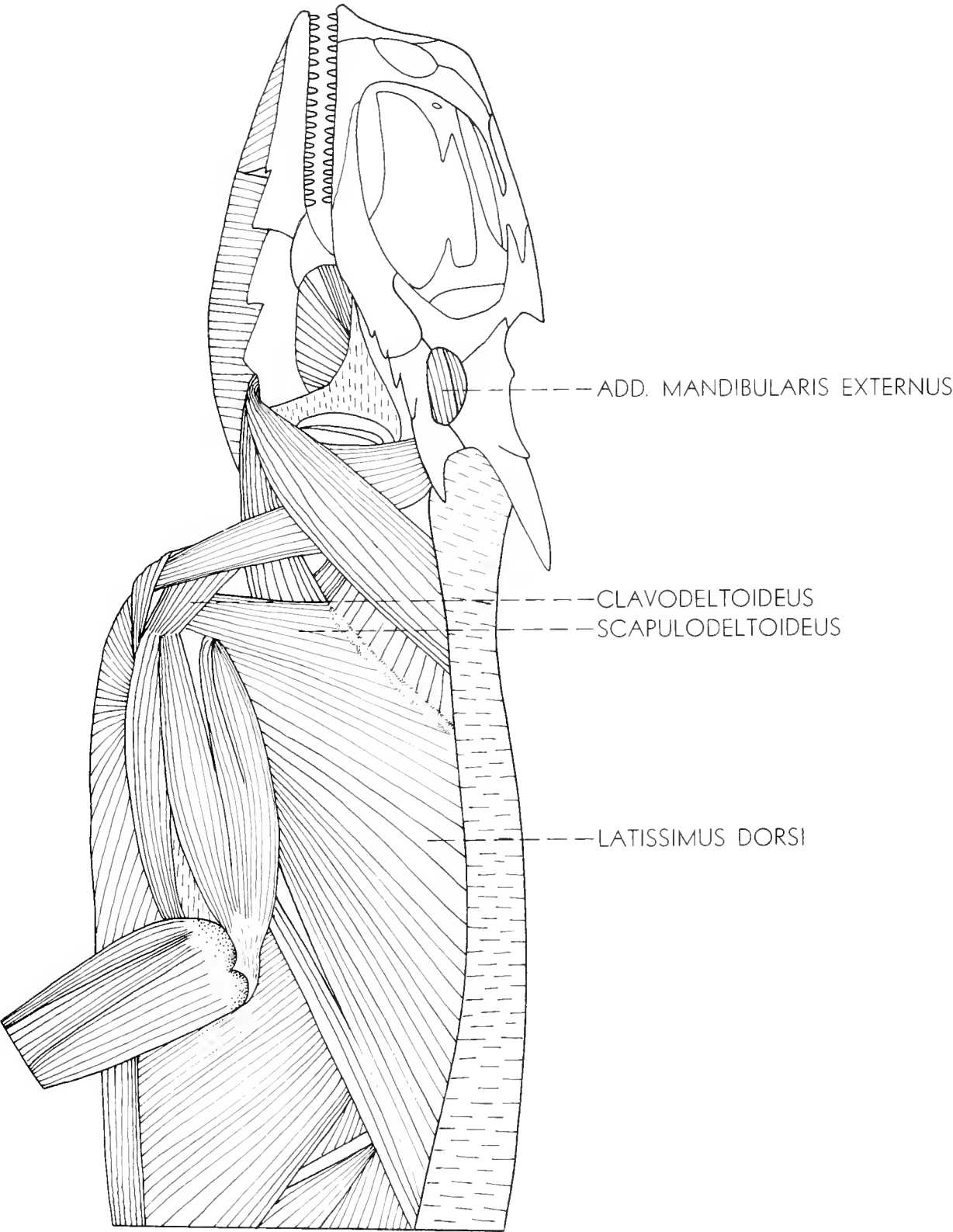


Fig. 14. *Phrynosoma platyrhinos platyrhinos*. Lateral view of head and thorax musculature. First depth. BYU 14838, 22833, 22838. X 5.5.

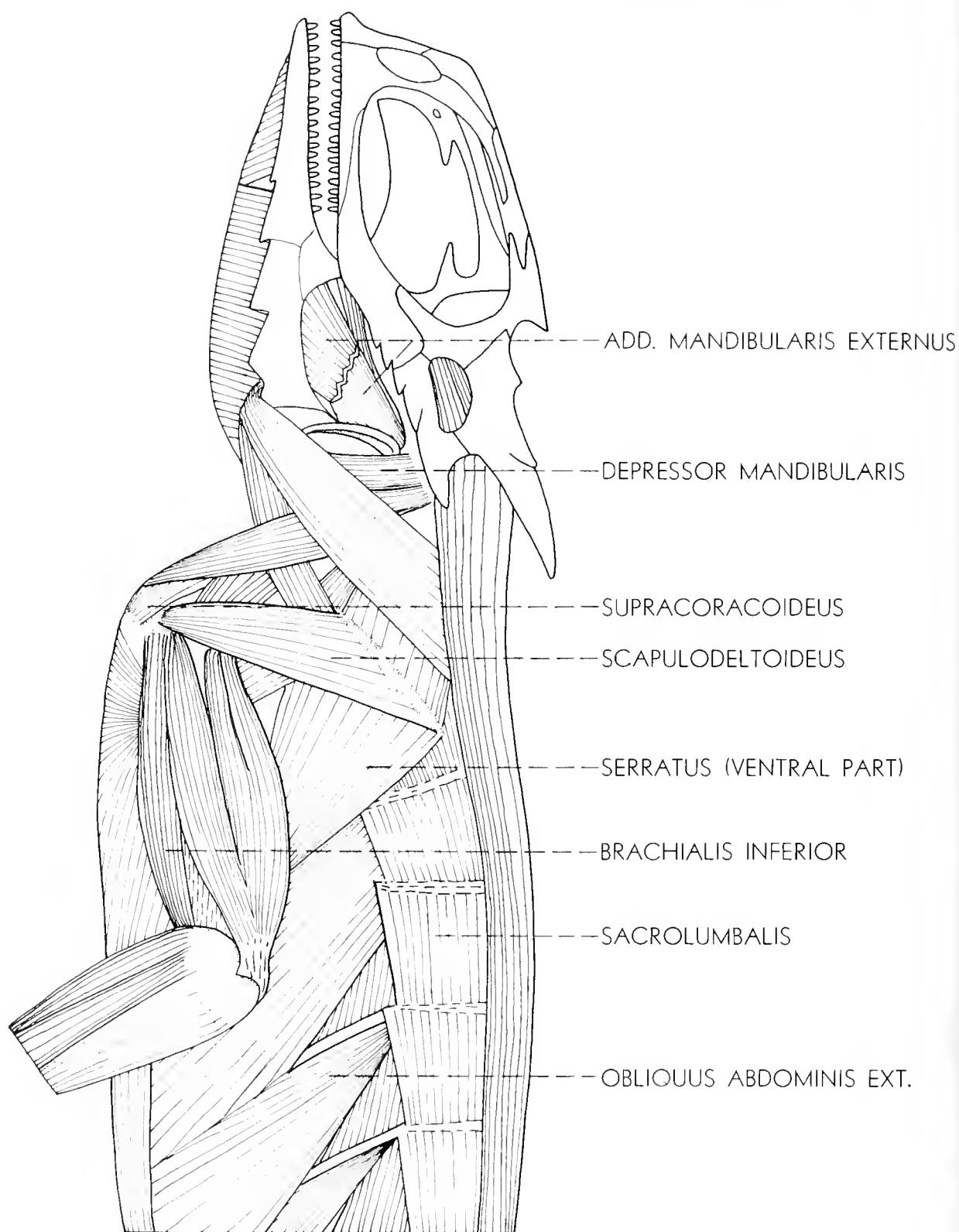


Fig. 15. *Phrynosoma platyrhinos platyrhinos*. Lateral view of head and thorax musculature. Second depth, BYU 22832, 22838, 22833, 22839, 22860, 22841, 22840, 22830, 22823. X 5.5.

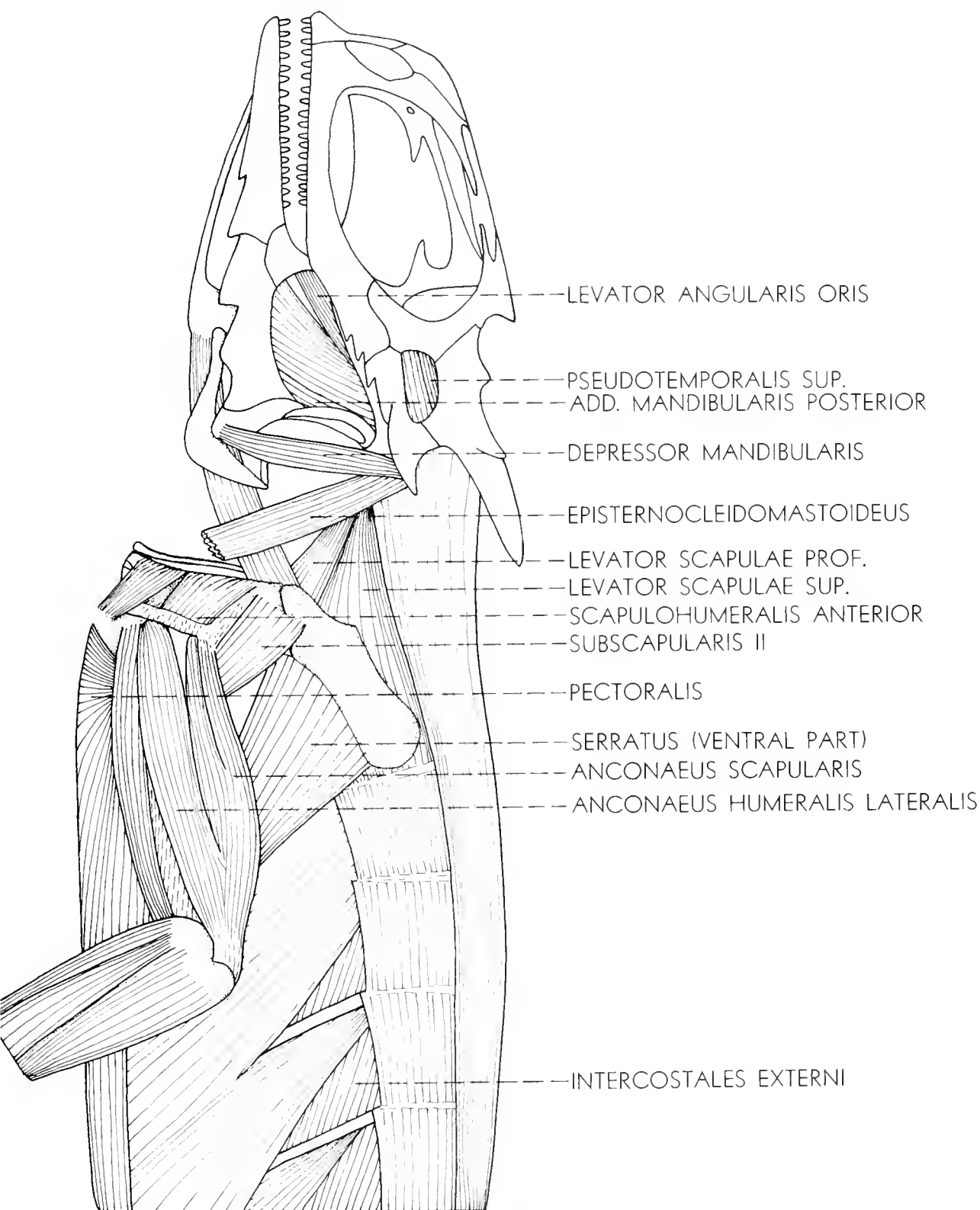


Fig. 16. *Phrynosoma platyrhinos platyrhinos*. Lateral view of head and thorax musculature. Third depth. BYU 14838, 22832, 22839, 22833, 22823, 22841, 23742, 22861, 22830, 22860, 22810. X 5.5.

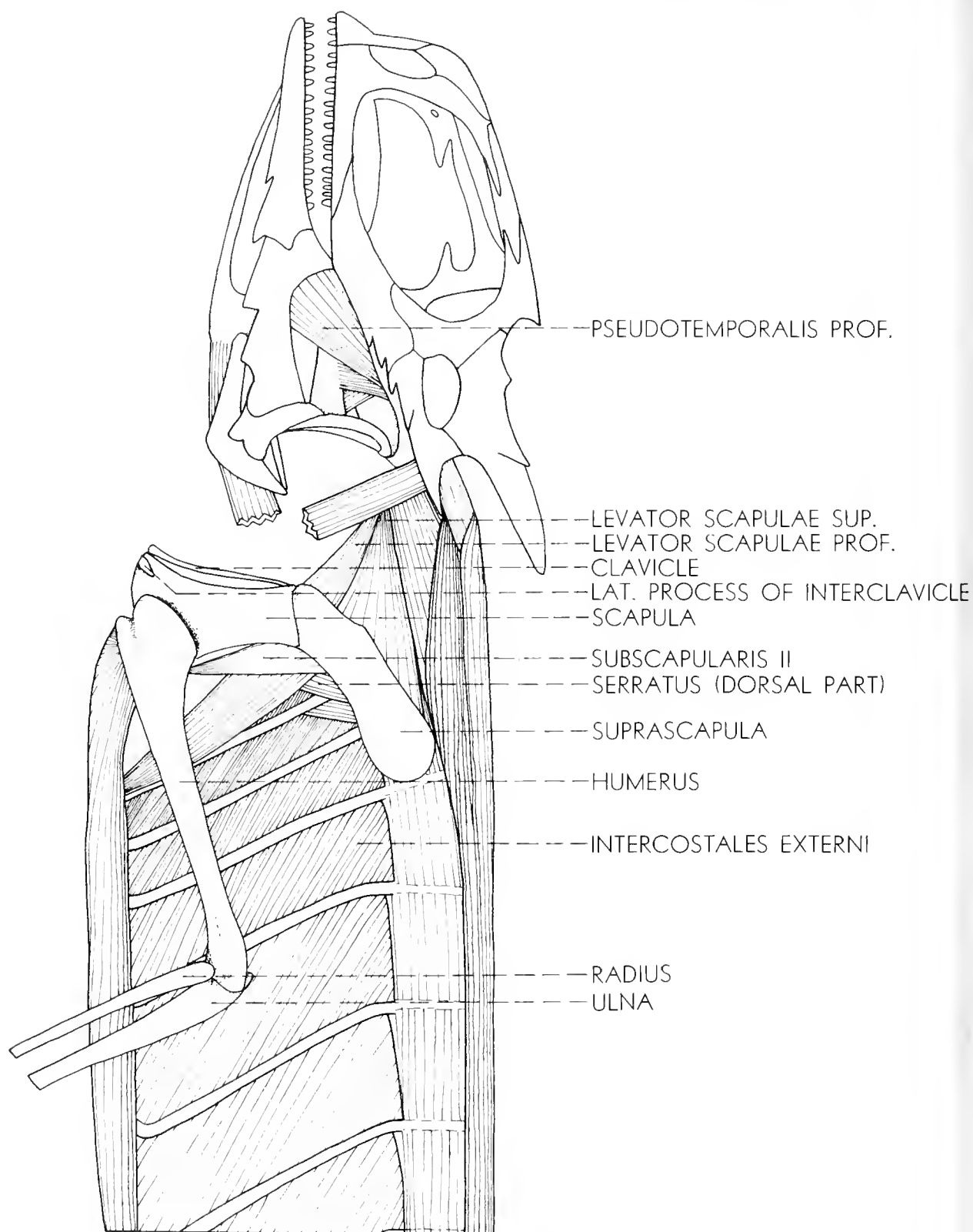


Fig. 17. *Phrynosoma platyrhinos platyrhinos*. Lateral view of head and thorax musculature. Fourth depth. BYU 22841, 22832, 22839, 22840, 22861, 22830, 22823. X 5.5.

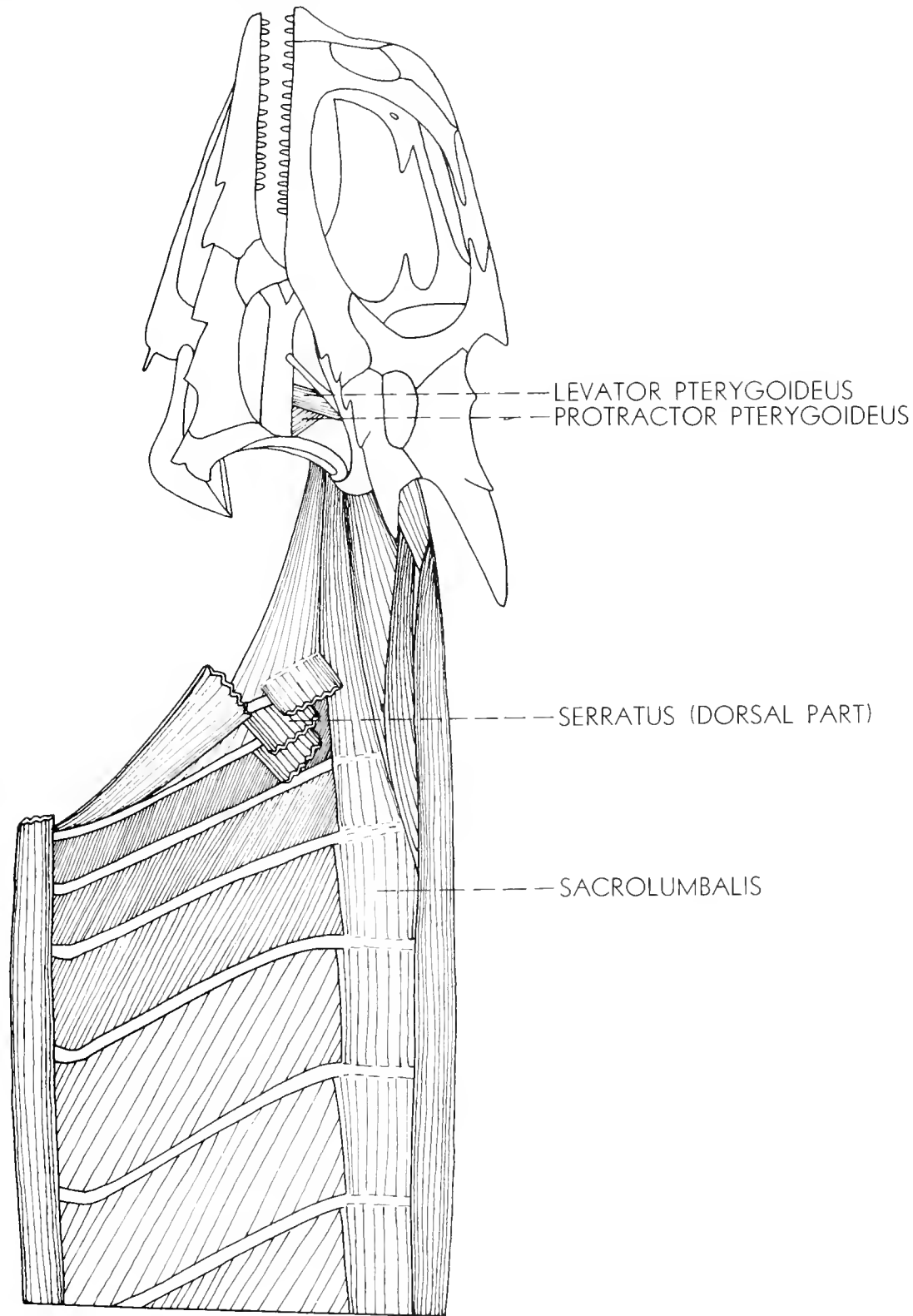


Fig. 18. *Phrynosoma platyrhinos platyrhinos*. Lateral view of head and thorax musculature. Fifth depth. BYU 22832, 22841, 22833, 22839, 22860, 22840. X 5.5.

M. trapezius (Figs. 10 and 13) originates from the dorsolateral fascia of the anterodorsolateral thoracic region posterior to the originating cervicomanibularis. Fibers pass anteroventrally deep to the skin to form a small, elongated, triangular muscle which overlaps superficially the latissimus dorsi proximally and distally the insertion of the levator scapulae superficialis and origin of the scapulodeltoideus. Insertion is onto the anterolateral surface of the suprascapula.

M. serratus is divided into dorsal and ventral parts. The dorsal part (Figs. 17 and 18) originates as three slips in the dorsolateral region and from the posterolateral borders of the first three cervical ribs. Fibers of each slip extend posterodorsolaterally, overlapping each other and insert separately onto the dorsal area of the mesial side of the suprascapula. The ventral part of the trapezius (Figs. 11, 15, and 16) originates as two slips ventrally and posteriorly to the dorsal part of the serratus. The anterior slip arises from the anterior and lateral surfaces of the second cervical rib. Fibers extend anterodorsally overlapping most of the anterior and lateral surfaces of the second cervical rib. The posterolateral, flap-like fibers usually extend far enough posteriorly to overlap part of the lateral surface of the third cervical rib. Insertion is onto the mesial surface of the suprascapula ventral to the insertion of the dorsal part of the serratus.

The larger, posterior slip originates from the ventral tips and ventrolateral surfaces of the third, fourth, and fifth cervical ribs. Fibers extend anterodorsally to insert onto the lateral surface of the suprascapula.

M. costocoracoid (Fig. 9) originates from the anterior border of the first sternal rib. Fibers extend anteromesially to insert onto the anterior part of the posterolateral edge of the sternum and the posterior edge of the sternal end of a long, flat ligament which extends anterodorsolaterally from the most lateral part of the anterior sternum to attach onto the mesial surface of the scapula, dorsal to the subscapularis I.

M. subscapularis II (Figs. 11, 16, and 17) originates from two heads. The lateral head arises from the ventrolateral surface of the suprascapula and the dorsolateral surface of the scapula deep to the proximal scapulodeltoideus and ventrolateral to the larger ventral slip of the serratus. The mesial head originates along the mesial surface of the suprascapula. Fibers of the two heads extend posteroventrally, join ventral to the proximal end of the larger, ventral

serratus slip and continue for insertion onto the posteromesial surface of the large, anteromesial head of the humerus.

In some specimens the posterior fibers of the mesial head do not join the lateral head, but form a small tendon which continues from the junction of the two heads to insert mesially with the lateral head onto the anteromesial head of the humerus.

M. subscapularis I (not illustrated) originates from the entire dorsal surface of the coracoid. Fibers extend posterolaterally between the coracoid and the long, flat ligament located anterior to the costocoracoid (see costocoracoid). Insertion is onto the anteromesial surface of the large anteromesial head of the humerus.

M. internal sternocoracoid (not illustrated) originates from the posterodorsolateral surface of the sternum. Fibers extend anteriorly and overlap distally the distal fibers of the external sternocoracoid. Insertion is onto the anterodorsomesial surface of the coracoid mesial to the originating fibers of the subscapularis I.

M. external sternocoracoid (not illustrated) originates from the anterolateral border of the sternum. Fibers extend anteromesially, mesial to the subscapularis I, anteroventrolateral and ventral to the internal sternocoracoid, and dorsal to the articulation of the coracoid and sternum. Insertion is with the internal sternocoracoid onto the anterodorsomesial surface of the coracoid mesial to the originating fibers of the subscapularis I.

M. obliquus abdominis externus (Figs. 9, 11, and 15) originates anteriorly to posteriorly from the dorsal and postlateral surfaces of the ribs along the lateroventral approximate one-half and ventrolateral areas of the body. Anteriorly fibers are numerous and more easily distinguishable than the more dorsal fibers of the lateroventral abdominal region. Most of the latter are usually removed with the skin. The heaviest accumulation of fibers is anterior and along the lateroventral-ventrolateral angle of the body. Fibers extend posteroventrally and most insert onto the xiphoid rods, ends, and distal anterolateral surfaces of the ribs. Posteriorly a few fibers extend posteroventrally, ventral to the posterior slip of the intercostales externi and insert onto the pubis. It does not seem feasible to divide the obliquus abdominis externus into superficial and profundus parts.

M. intercostales externi (Figs. 11, 12, 16, and 17) originates from the posterolateral surfaces of the ribs deep to the obliquus abdominis ex-

ternus, the sacrolumbalis and serratus muscles. Fibers are most numerous anteriorly and extend posteroventrally from their respective origins to insert onto the anterolateral surface of the following posterior rib. A small slip arises by one to three heads from the reduced, posterior, three ribs. The heads unite and fibers extend posteroventrally for a common insertion onto the pubis.

M. intercostales interni (Fig. 9) originates deep to the intercostales externi from the posteromesial surfaces of the ribs. Fibers are most numerous anteriorly and very difficult to separate from the intercostales externi posteriorly along the sides of the body. The fibers parallel those of the intercostales externi and insert onto the posteromesial surface of the following posterior rib.

M. obliquus abdominis internus (Fig. 9) originates slip-like from the ventroanterior surfaces of the ribs, lateral and ventrolateral to the transversalis. Fibers extend vertically and slightly anteriorly for insertion onto the dorsolateral surface of the sternum, sternal ribs, xiphisternal rods, and dorsolateral rectus abdominis. The obliquus abdominis internus is superficial to the dorsolateral, lateral, and ventrolateral parts of the highly pigmented parietal peritoneum.

M. transversalis (not illustrated) originates from the ventrolateral surfaces of the thoracicolumbar vertebrae. Fibers extend anterolaterally and insert slip-like along the ventroposterior surfaces of the dorsal parts of the fourth and fifth cervical and first through ninth thoracicolumbar ribs. The transversalis is located in the ventromesial area of the fourth and fifth cervical and first through ninth thoracicolumbar ribs, deep to the dorsal parts of the obliquus abdominis internus, intercostales interni and ribs. It is superficial to the dorsal part of the highly pigmented parietal peritoneum.

Dorsal Neck Musculature

The dorsal back and neck musculature represents a multiple slip-like muscle mass combined into six major muscles. Excluding the rectus capitis anterior, the remaining five muscles appear to be closely related because of their relative positions. In some cases, fibers and tendons of one muscle intermingle posteriorly with the dorsal back musculature. This makes definite points of separation into complete, separate muscles difficult in some cases.

The terminology used for the dorsal neck musculature is taken from Oelrich (1956).

M. spinalis capitis (Fig. 11) originates multiply and tendinously from the neural spines of

the sixth and seventh cervical and first through fifth thoracicolumbar (dorsal) vertebrae, and dorsal back musculature. Long, single tendons extend anteriorly, deep to the dorsal fascia, and coalesce in the immediate dorsal neck region to form a continuing muscle belly which inserts onto the posterior parietal and supraoccipital. The spinalis capitis is superficial to the rest of the dorsal neck musculature.

M. rectus capitis posterior (Fig. 12) originates tendinously from the neural spines, neural arches and transverse processes of the cervical and thoracicolumbar vertebrae. A few dorsal fibers extend anteriorly and insert along the neural spines of the second, third, and fourth cervical vertebrae overlapping most anteriorly the posterior approximate one-half of the originating fibers of the obliquus capitis magnus. The remaining ventrolateral fibers extend anteriorly from the origin and insert along the neural spines, neural arches, and transverse processes of the cervical vertebrae. The rectus capitis posterior is divided posteriorly into medial and lateral sections which constitute the dorsal back musculature and may be called the spinus dorsi and longissimus dorsi respectively.

M. obliquus capitis magnus (Fig. 12) originates from the neural spines and neural arches of the second and third cervical vertebrae. Fibers extend obliquely in an anterolateral direction dorsal to the larger, most anterior part of the rectus capitis posterior and dorsomesial to the longissimus cervicis to insert onto the extreme ventrolateral supraoccipital and posterior exoccipital.

M. longissimus cervicis (Fig. 12) originates from a tendinous sheath located along the lateral margin of the ventral part of the rectus capitis posterior. Some fibers which extend ventrally beyond the tendinous sheath of the rectus capitis posterior originate from the area ventral to the transverse processes of the third and fourth cervical vertebrae. A few posterior fibers are continuous with the dorsal back musculature. From their respective origins the fibers extend obliquely in an anterolateral direction, posterior and parallel to the obliquus capitis magnus and insert onto the lateral extension of the exoccipital, including its paraoccipital process.

M. rectus capitis anterior (not illustrated) originates from the ventral surface of the vertebral column and the capitular regions of the anterior thoracicolumbar and cervical ribs. Originating fibers extend anteriorly along the

ventral spinal column and become partially divided into four heads. Two lateral heads, one on each side, insert tendinously onto the ventral spheno-occipital process and receive fibers from both the lateral and mesial heads. The remaining two heads located mesial and dorsal to those inserting tendinously onto the spheno-occipital process, insert onto the majority of the ventral and posterior basioccipital.

M. longissimus capitis (Fig. 12) originates from the lateral regions of the atlas and axis, and the anteroventrolateral inserting fibers of the rectus capitis posterior. Fibers continue anteroventrally forming a cone-shaped muscle which overlays dorsally the inserting levator scapulae superficialis. Insertion is onto the lateral and posterior sides of the spheno-occipital process.

DISCUSSION

A study of the anterior osteology and myology of *Phrynosoma* portrays major peculiarities and trends existing in the genus *Phrynosoma* which are not evident in other iguanids examined.

Osteology

Based on comparisons of the skulls of *Sauromalus* (Avery and Tanner, 1964) and *Ctenosaura* (Oelrich, 1956), and the general accounts of reptile osteology by Williston (1925) and Romer (1956), Avery and Tanner indicate osteological characters of the skulls of iguanid lizards to be stable within generic limits. Studies on *Sauromalus* (Avery and Tanner, 1964), *Crotaphytus* (Robison and Tanner, 1962), and *Ctenosaura* (Oelrich, 1956) portray the apparent general stability of the osteological characters found in the iguanid skulls; however, skulls of *P. p. platyrhinos* and *P. d. hernandesi* observed in this study differ from the iguanid skull as portrayed by the above authors in that the postfrontals and lacrimals are absent, and spines project from various bones of the skull.

Among the osteological peculiarities in *Phrynosoma* listed by Etheridge (1964) are the absence of lacrimal and postfrontal bones. Cope (1900) states that the lacrimals are present in *Phrynosoma douglassi*, *Phrynosoma cornutum*, and *Phrynosoma coronatum*, and describes the lacrimal as being small and not reached by the anterior angle of the jugal. He also found the postfrontal present as a rudiment in *Phrynosoma douglassi*, but "coossified" in *Phrynosoma cornutum* and *Phrynosoma coronatum*. Bryant (1911) considers the postfrontals to be usually ossified and the lacrimals small in *Phrynosoma*. Observations of immature and mature skulls of *P. p. platyrhinos* and *P. d. hernandesi* confirm the findings of Etheridge (1961) to the extent that the lacrimal and postfrontal bones are not present in the two species considered in this study.

Smith (1960) states that the compounding of bones is an evolutionary trend, increasingly so in reptiles, mammals and birds. The deviation by *Phrynosoma* from the general iguanid skull, particularly evidenced by the fusion or loss of the lacrimal and postfrontal bones, suggests the hypothesis that *Phrynosoma* is a highly specialized iguanid genus.

Although it is not the primary purpose of this paper to determine the detailed phylogeny of *Phrynosoma*, a comparison of the occipital spines and the lower jaws of *platyrhinos*, *douglassi* and *ditmarsii* indicates a possible phylogenetic trend. *P. platyrhinos* exhibits elongated occipital spines and a smaller lower jaw, whereas *douglassi* and *ditmarsii* exhibit much shorter occipital spines and a larger lower jaw. It appears that with an increase in the size of the occipital spines in *Phrynosoma* there is a decrease in the size of the lower jaw. The ratio of the length and depth (immediately posterior to the coronoid process) of the lower jaw between these three species supports such a conclusion (Table 1).

Reeve (1952) considers *P. ditmarsii* and *P. solare* to be the most specialized forms in the genus *Phrynosoma*. The former species lacks occipital spines, whereas the latter possesses four elongated ones. According to Reeve, only three specimens of *Phrynosoma ditmarsii* are known, the two listed in Table 3 and a third in the American Museum of Natural History.

Phrynosoma ditmarsii may be a primitive phrynosomian which is a relict of a former essentially spineless group which gave rise to the occipital spined, horned lizards of today, or it may be a specialized branch of the short-horned *douglassi* group. A selection for occipital (also mandibular and temporal) spines may have essentially eliminated the primitive spineless group of which *P. ditmarsii* may be a relict. The inverse relationship in the relative sizes of

Table 1. Comparative measurements of the occipital spines, lower jaws and quadrate showing size relationships of these structures in *Phrynosoma ditmarsii*, *douglassi* and *platyrhinos*.

	<i>ditmarsii</i> ^a		<i>douglassi</i>		<i>platyrhinos</i>	
	Range	Average	Range	Average	Range	Average
Length of occipital spines	-0-	-0-	1.8-2.2	2.00	3.9-6.8	4.84
Depth of lower jaw ^{oo}	3.1-3.5	3.30	2.7-3.5	2.93	1.2-1.7	1.52
Length of lower jaw	15.2-19.0	17.10	15.9-19.3	17.43	13.9-15.5	14.84
Length of quadrate	5.2-8.8	7.00	5.5-7.3	6.38	4.0-4.7	4.34

^aMeasurements taken from preserved specimens and X-rays. These measurements may be conservative.

^{oo}Immediately posterior and next to the coronoid process.

the occipital spines and the lower jaw indicates that the large size of the lower jaw may have been an important protective device correlated with burrowing habits. The spines could have been selected for as a protective device, thus relieving the selection pressure of a protective nature for a massive lower jaw. Smith (1946) quotes Ditmar (1936) as writing concerning *P. ditmarsii*, "The rarity of this horned lizard might be accounted for in consideration of its relatively smooth skin and absence of head spines rendering it an easy prey for various snakes. Thus, the general abundance of those species with bristling body spines and long horns upon the head might also be explained." Ditmar's statement is indicative of a possible major selective force (that of predation by other animals) involved in the acquisition of long head spines in *Phrynosoma*. Such speculation, however, should also include the *douglassi* group which does not have the bristling body or head ornamentation that would interfere with feeding by predators but is, nevertheless, abundant in many geographical areas.

The shape of the skulls of *Phrynosoma douglassi* and *Phrynosoma platyrhinos* shows a general posterodorsal shift of the skull elements from the shapes of the skulls of *Sauromalus* and other iguanids examined. The shift in the skull components has involved a dorsal uplift and lateral expansion of the posterior part of the skull with a subsequent shortening of the skull anteriorly. The uplift posteriorly and the shortening of the skull anteriorly appear to have produced the snubbed nose and the greater general posterodorsal-anteroventral-posterior angle of the skull of *Phrynosoma* as compared to the basic iguanid structure as found in *Sauromalus* (Table 2).

As indicated in Table 2, the higher percentage resulting from a ratio of skull depth

skull length in *Phrynosoma* demonstrates a posterodorsal shift of the skull bones in *Phrynosoma* producing a much shorter and relative wider skull than is commonly observed in the basic iguanid structure.

The oblong temporal fenestra in *Sauromalus* is directed lengthwise much more anteriorly than it is in *Phrynosoma*. This condition also suggests the posterior shift in the skull elements to have taken place, in that the anterior part of the supratemporal fossa is pushed posteriorly to its nearly mesiolateral, generally, oblong location in *Phrynosoma*.

In *Phrynosoma platyrhinos* the occipital bones are at the approximate level of the posterior surfaces of the squamosals. In *Phrynosoma douglassi* the occipital bones are well anterior of the posterior surfaces of the squamosals.

The degree of shift of the bones of the posterior part of the skull has produced different positions and relationships between the occipital and squamosal bones in adult *Phrynosoma platyrhinos*, *Phrynosoma douglassi* and *Phrynosoma*

Table 2. Ratios of measurements indicating the posterodorsal shift of the skull bones of the genus *Phrynosoma*.

Species	Specimen number	*Skull depth to length	Ratio in percentage
<i>Sauromalus obesus</i>	BYU 21723	9.36	25
	BYU 21728	8.32	25
	BYU 21734	7.28	25
<i>Phrynosoma platyrhinos</i>	BYU 22816	7.16	44
	BYU 22824	7.15	47
	BYU 22813	8.16	50
<i>Phrynosoma douglassi</i>	BYU 22817	8.18	44
	BYU 23811	8.15	53
	BYU 14333	8.17	47

*Ratio of measurements is to nearest mm.

ditmarsii. These differences can be best expressed by determining the ratio of length to width of the skull in the two species and by determining the differences in the angles produced by the position of the skull bones, particularly between the occipital and squamosals.

Measurements found in Table 3 show a comparison of the distance between the third temporal spines (skull width) and the distance from the posterior surface of the occipital condyle to the anterior, medial surface of the premaxilla (skull length). The ratio of the two measurements indicates a greater lateral expansion of the posterior part of the skull in *douglassi* and *ditmarsii* than in *platyrhinos* in that in the former species the width of the skull is wider, as indicated by the smaller ratio percentage.

Table 3. Ratios and measurements indicating the relationship of skull length to skull width in *Phrynosoma platyrhinos*, *Phrynosoma douglassi* and *Phrynosoma ditmarsii*.

Species	Specimen number	Ratio of skull length to skull width in mm.*	Ratio in percentage
<i>Phrynosoma platyrhinos</i>	BYU 22816	16.0/20.2	79.3
	BYU 22824	14.8/18.8	78.7
	BYU 22813	16.1/20.3	79.3
	BYU 22823	15.5/19.4	79.9
	Average	15.6/19.7	79.2
<i>Phrynosoma douglassi</i>	BYU 22817	18.3/25.0	73.2
	BYU 23811	15.2/19.3	78.8
	BYU 22815	15.8/21.2	74.5
	BYU 14333	16.7/22.2	75.2
	Average	16.5/21.9	75.3
<i>Phrynosoma ditmarsii</i> °	USNM 36013	15.3/21.7	70.5
	USNM 36022	16.5/23.0	71.7

*These measurements were made from X-ray plates.

The position of the occipital condyle in adult specimens when compared to the level of the posterior surfaces of the ventrally projecting parts of the squamosals, suggests that the posterior part of the skull of *Phrynosoma douglassi* is more laterally expanded than in *Phrynosoma platyrhinos*; also, in adult *douglassi* the occipital condyle is noticeably anterior to the posterior surfaces of the squamosals, whereas in *platyrhinos* the occipital condyle is at the level of the posterior surfaces of the squamosals or slightly posterior to that level.

In an ontogenetic series of specimens of *douglassi*, early juveniles do not show the marked anterior location of the occipital condyle in relation to the posterior surfaces of the squa-

mosals. The location of the occipital bones in early juveniles of this species resembles closely their location in *platyrhinos*. As one ascends the age series in *douglassi* there is a progressive development of anterior convexity of the occipital region, whereas a series of different aged *platyrhinos* skulls do not show such a convexity.

The similarity of location of the occipital bones in early juveniles of these species, together with the marked difference in the position of these bones in adult *douglassi*, demonstrates an ontogenetic anatomical difference between the two species.

X-rays taken of adult *P. ditmarsii* (USNM 36013, 36022) and compared to skulls of *douglassi* show an obvious similarity of structure and pattern in their skulls, particularly in the occipital region. Unfortunately, juveniles of *ditmarsii* are not available; however, the marked similarity of adult skulls indicate that *ditmarsii* is closely related to *douglassi* and may be expected to show a similar ontogenetic development of the skull.

If we consider an isosceles triangle to have its vertex at the middle of the occipital condyle and its base, the distance between the middle of the posterior surfaces of the ventrally projecting parts of the squamosal, then we find in *Phrynosoma douglassi* the base angles of the triangle to be approximately 30 degrees. This portrays the position of the occipital condyle in *douglassi* to be where the legs of the isosceles triangle meet to form the vertex angle. The occipital condyle is noticeably anterior to the level of the posterior surfaces of the squamosals (see Table 4).

In *Phrynosoma platyrhinos* the angle comparable to the aforementioned vertex angle in *Phrynosoma douglassi* is usually a straight angle; however, there is a tendency in some specimens of *platyrhinos* for this angle to be obtuse slightly posterior to the level of the posterior surfaces of the squamosals. For this reason no isosceles triangle or base angles comparable to those previously discussed for *douglassi* are present in *platyrhinos*.

In *douglassi* the anterior position of the occipital bones may be accounted for because of the lateral enlargement and expansion of the posterior part of the skull in this species (see Table 3). Determination of the ratio of skull length to skull width (Table 3) and the degrees of the base angle (Table 4) in *P. ditmarsii* demonstrates a close similarity to *P. douglassi*. The close resemblance of *ditmarsii* to *douglassi* suggests that *ditmarsii* is a branch (presumably the terminal one) of the *douglassi* phylogenetic line.

Table 4. Determinations of considered parts of an isosceles triangle portraying the relative position of the occipital condyle to the posterior surfaces of the squamosals.

Species	Specimen number	Measurements of isosceles triangle in mm.		Degrees of base angle determined by the law of cosines
		leg	base	
<i>Phrynosoma platyrhinos</i>	BYU 22816	...	14.0	
	BYU 22824	...	12.8	
	BYU 22813	13.6	
	BYU 22823	13.7	
<i>Phrynosoma douglassi</i>	BYU 22817	10.0	17.0	32
	BYU 23811	7.7	13.3	30
	BYU 22815	8.2	14.2	30
	BYU 14333	9.0	16.0	27
Average		8.7	15.1	30
<i>Phrynosoma ditmarsii</i> *	USNM 36013	8.0	14.8	22
	USNM 36022	9.3	17.0	24

*These measurements were made from X-ray plates.

From the series of specimens examined, it appears that *douglassi* and *platyrhinos* differ in the number and arrangement of the sternal ribs. The former species has three sternal ribs, whereas *platyrhinos* shows a variation in number. In *platyrhinos* three variations occur between the sternum, xiphisternal rod, and the third rib. In approximately an equal number of specimens, the third rib has an attachment onto the sternum (and also articulates with the anterior edge of the xiphisternal rod at the point of attachment), or is attached to the anterior surface of the xiphisternal rod at a variable distance distal to the sternum. In a few specimens the third rib approaches the sternum but ends in the soft tissues without articulating with either the sternum or the xiphisternal rod.

We also noticed that the third rib in *platyrhinos* is variable in size not only when compared to the first two ribs but also when compared with the third rib in a series.

According to Etheridge (1964) the usual number of sternal ribs in *platyrhinos* is two. Our data, based on 31 specimens, indicates that in 51.6 percent the third rib actually articulates with the sternum and that 48.4 percent either articulates with the xiphisternal rod or ends in the soft tissue between the second rib and xiphisternal rod. There may be a variation in this character between populations. Our series is from Nevada and Utah and may not reflect the same percentage of variation as in a series from farther south in California.

In contrast, *douglassi* and presumably *ditmarsii* (only USNM 36022 was examined for this character) have three sternal ribs all of approxi-

mately equal size, with the third always articulating with the sternum and not in contact with the xiphisternal rod at the point of sternal attachment.

The number of sternal ribs found in *Crotaphytus* (Robison and Tanner, 1962), *Sauromalus* (Avery and Tanner, 1964) and some sceloporines (Etheridge, 1964) range from three to five; therefore, it appears that *douglassi* more closely resembles other iguanids than does *platyrhinos*, based upon sternal rib comparisons.

MYOLOGY

Except for the studies of Sanders (1874), Camp (1923), and Norris and Lowe (1951), myological considerations of the genus *Phrynosoma* are meager. Although a study of the myology of all species of *Phrynosoma* is beyond the scope of this paper, comparisons of representative long horn and short horn species seemingly portray an anterior myological arrangement. The comparisons are not only somewhat different among species of *Phrynosoma*, but also far different in scope than the variations that exist between other iguanid genera, as portrayed by Oelrich (1956), Robison and Tanner (1962), and Avery and Tanner (1964).

A comparison of the anterior anatomy of *Phrynosoma d. hernandesi* with that of *Phrynosoma p. platyrhinos* shows observable myological differences. In *douglassi* the dorsal part of the M. serratus consists of a small anterior slip and an elongated posterior slip. The posterior fibers of the latter slip may be the beginning of a third slip and homologous to a third slip in *platyrhinos*.

The *M. latissimus dorsi* of *douglassi* does not possess a small posterior slip grossly inserting into the *M. pectoralis*, as does *platyrhinos*. The *M. pseudotemporalis superficialis* is much more massive and identifiable in *douglassi* than in *platyrhinos*. The *M. obliquus abdominis externus* also is proportionately more extensive in the former species.

The *M. depressor mandibularis* is approximately twice the size in *douglassi* as in *platyrhinos* specimens of the same size. The adductor mandibularis musculature is also more massive in *douglassi*.

Phrynosoma p. platyrhinos appears to be more specialized myologically than *Phrynosoma d. hernandesi*. In the former species the *M. latissimus dorsi* has a posterior segment which attaches to the *M. pectoralis*. The *M. latissimus dorsi* in *Phrynosoma douglassi* is similar to the general iguanid structure, as portrayed by Robison and Tanner (1962) and Avery and Tanner (1964), in that segmentation is lacking. The *M. obliquus abdominis externus* is smaller in *Phrynosoma platyrhinos* than it is in *Phrynosoma douglassi*. It is extensive and massive in *Crotaphytus* (Robison and Tanner, 1962) and *Sauromalus* (Avery and Tanner, 1964). The presence of the *M. pseudotemporalis superficialis* to a much lesser degree in *platyrhinos*, as compared to *douglassi*, is also indicative of a greater specialization of *platyrhinos* in that this muscle is massively present in *Ctenosaura* (Oelrich, 1956), *Crotaphytus* (Robinson and Tanner, 1962), and *Sauromalus* (Avery and Tanner, 1964). The myological differences between *Phrynosoma platyrhinos* and *Phrynosoma douglassi* indicate that *platyrhinos* is more specialized than *douglassi* and has in some characters departed from the basic iguanid structures more obviously than in the less specialized *douglassi*.

Avery and Tanner (1964) suggest the myology to be relatively stable in the Iguanidae, to the extent that myological characters may be used for interpreting phylogenies between iguanid genera. Based upon anterior myological comparisons between *Ctenosaura* (Oelrich, 1956), *Crotaphytus* (Robison and Tanner, 1962), *Sauromalus* (Avery and Tanner, 1964), and *Phrynosoma*, it appears that the myology is relatively stable at the generic level. However, *Phrynosoma* shows a greater departure from the basic iguanid structure than has previously been known to exist.

Of the fifty-seven muscles of *Phrynosoma platyrhinos* and *Phrynosoma douglassi* considered, fifty do not appear to differ significantly from other genera (Robison and Tanner, 1962;

Avery and Tanner, 1964; Oelrich, 1956). Muscles of the two species which show a marked observable difference as compared to other aforementioned iguanid genera are the *M. sternohyoideus*, *M. subscapularis* II, *M. episternocleidomastoideus*, *M. serratus*, *M. trapezius*, *M. obliquus abdominis externus*, and *M. branchiohyoideus*.

The *M. sternohyoideus* in *Phrynosoma* consists of three separate muscles, whereas a single sternohyoideus is present in *Ctenosaura* (Oelrich, 1956), *Crotaphytus* (Robison and Tanner, 1962), and *Sauromalus* (Avery and Tanner, 1964). The three sternohyoideus muscles in *Phrynosoma* were probably derived originally from a single foldlike muscle similar to the sternohyoideus found in the latter three genera. This muscle may have important phylogenetic significance in future studies of the phylogeny of iguanid genera, particularly of those genera closely related to *Phrynosoma*.

The *M. subscapularis* II has two originating heads in *Phrynosoma*, whereas there is one originating head in *Crotaphytus* (Robison and Tanner, 1962) and *Sauromalus* (Avery and Tanner, 1964).

In *Phrynosoma* the *M. episternocleidomastoideus* originates by three heads. Avery and Tanner (1964) report the *M. episternocleidomastoideus* to originate by a single head in *Sauromalus*, *Sceloporus*, and *Dipsosaurus*. Robison and Tanner (1962) state that the *M. episternocleidomastoideus* originates as a single head in *Crotaphytus wislizeni* and from two heads in *Crotaphytus collaris* and *Crotaphytus reticulatus*. Oelrich (1956) describes the *M. episternocleidomastoideus* to have a single head in *Ctenosaura pectinata*.

The *M. serratus*, *M. trapezius*, and *M. obliquus abdominis externus* are reduced in *Phrynosoma platyrhinos* and *Phrynosoma douglassi* based on the occurrence of these muscles in *Sauromalus* (Avery and Tanner, 1964) and *Crotaphytus* (Robison and Tanner, 1962). *Phrynosoma* lacks the anterior two slips of the ventral part of the *M. serratus* as described by Robison and Tanner (1962) for *Crotaphytus*. The *M. trapezius* is reduced and much less extensive in *Phrynosoma* than it is illustrated and described to be for the above genera. Mivart (1867) states that the *M. trapezius* is very extensive in *Iguana tuberculata*, which gives further evidence of the peculiarity of the reduced nature of the *M. trapezius* in *Phrynosoma* as compared to other iguanids. The *M. obliquus abdominis externus* appears to be reduced in *Phrynosoma*

when compared to its existence in *Crotaphytus* (Robison and Tanner, 1962) and *Sauromalus* (Avery and Tanner, 1964). The fibers are much less extensive and abundant except in the region of the lateroventral-ventrolateral angle of the body.

The M. branchiohyoideus in *Phrynosoma* is much more extensive than it is in *Sauromalus* (Avery and Tanner, 1964), *Crotaphytus* (Robison and Tanner, 1962), or *Ctenosaura* (Oelrich, 1956).

The structure of the M. biceps in *Phrynosoma* is similar in *Ctenosaura pectinata*, *Crotaphytus collaris*, *Crotaphytus wislizeni*, *Sceloporus magister*, and *Iguana tuberculata* (Howell, 1936), in that each has a proximal, small, muscular body in the specimens examined. Howell (1936) describes the M. biceps of *Iguana* as having a short proximal belly and a distal belly, the former having fibers which converge (insert onto) a broad tendon which separates the two bellies. Each has a separate origin. In *Phrynosoma* the proximal, small, muscular body gives rise to a narrow tendon which parallels a broader originating posterior tendon of the M. biceps. Each of the two tendons gives rise to separate muscular heads which unite distally. The main difference in the proximal structure of the M. biceps between *Phrynosoma* and *Ig-*

uana (Howell, 1936) appears to be that in the former, the M. biceps is divided to a greater degree than in the latter. The M. biceps of *Sauromalus* originates from a single, long, broad tendon and lacks an anterior, small, muscular body. Therefore, it appears that *Phrynosoma* is more closely related to *Crotaphytus* and *Sceloporus* than *Sauromalus*.

The dorsal neck musculature, illustrated and described in this study for *Phrynosoma platyrhinos*, consists of the same six major muscles listed and partially described by Oelrich (1956) for *Ctenosaura*. The dorsal neck musculature of *Phrynosoma douglassi* and *Phrynosoma platyrhinos* does not appear to be drastically different from that of *Ctenosaura*. However, there is some segmentation which is difficult to interpret, as well as some intermingling of fibers and tendons of the dorsal neck muscles.

Even though the myology may be more adaptable and changeable than other morphological structures as suggested by Brock (1938), it appears to be stable to the extent that the myology of species and genera can be characterized. There does not appear to be a single general trend in the myology, such as segmentation alone, that implies myological specialization of a species due to any one condition.

CONCLUSIONS AND SUMMARY

This study confirms the work of Etheridge (1964) in suggesting the peculiarity of the genus *Phrynosoma* within the family Iguanidae. The anterior osteology and myology of *Phrynosoma platyrhinos platyrhinos* Girard and *Phrynosoma douglassi hernandesi* Girard indicate *Phrynosoma* to be highly specialized and to differ significantly from the Iguanid structure as portrayed by Oelrich (1956), Robison and Tanner (1962), and Avery and Tanner (1964). They also differ because of: (1) absence of lacrimal and postfrontal bones; (2) occurrence of occipital (also mandibular and temporal) spines; (3) posterodorsal shift of the skull elements; (4) divided nature of the M. sternohyoideus, M. subscapularis II and episternocleidomastoideus; (5) reduced nature of the M. serratus, M. trapezius, M. obliquus abdominis externus; and (6) greater mass of the M. branchiohyoideus.

The absence of lacrimal and postfrontal bones, occurrence of occipital (also mandibular and temporal) spines, and posterodorsal shift in the shape of the skull indicate *Phrynosoma* to be a highly specialized iguanid genus.

The divided nature of the M. sternohyoideus, M. subscapularis II, and M. episternocleidomastoideus, and the reduced condition of the M. serratus, M. trapezius, and M. obliquus abdominis externus, and the expanded nature of the M. branchiohyoideus are also suggestive of specialization of the genus *Phrynosoma* from the iguanid structure as portrayed by other authors (loc. cit.).

The structure of the M. biceps in *Phrynosoma* indicates that this is more closely related to *Sceloporus* and *Crotaphytus* than to *Sauromalus*, in that a small, anterior, muscular body of the M. biceps is lacking in the latter.

Comparison of the anterior anatomy of *Phrynosoma platyrhinos* and *Phrynosoma douglassi* shows *platyrhinos* to be more specialized than *douglassi* in that *platyrhinos* shows a greater departure from the basic iguanid structure. In *platyrhinos* the tendency for a reduction in size and a loss of a sternal articulation for the third sternal rib, segmentation of the M. latissimus dorsi, and a reduction in size of the M. obliquus abdominis externus and the M. pseudo-

temporalis superficialis when compared with *douglassi*, are indicative of the greater specialization of *platyrhinos*.

There appears to be an inverse relation between the relative sizes of the occipital spines and the size of the lower jaw (Table I) in *Phrynosoma* which may be indicative of intra-generic relationships and phylogeny.

Observation of the type and paratype (USNM 36013, 36022) of *Phrynosoma ditmarsii* leaves no doubt that it is a unique species belonging to the *douglassi* group. The almost complete absence of spines, the pronounced supra-occipital notch, the massive lower jaw, and the pronounced anteriorly convex occipital structure are obviously relating characters in these two species. An x-ray of the skull of *ditmarsii* also indicates a close, if not identical, series of bones

and bone patterns to *douglassi*.

There is no evidence to support a conclusion that the *douglassi* group, even though more primitive, is the ancestral stock of the *platyrhinos* phylogenetic line. In fact both lines show structural specializations that are peculiar to each. In *platyrhinos* the large spines, reduced number of sternal ribs, and the muscular specializations are unique. Species in the *douglassi* group are peculiar in that the spines are short or absent, the skull is shorter, wider, and with a noticeable convexity in the occipital region, and the lower jaw is larger.

Comparative osteological and myological studies on genera believed to be closely related to *Phrynosoma* are needed in order that phylogenetic relationships between *Phrynosoma* and other genera can be correctly determined.

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